FACTORY

MANAGEMENT AND MAINTENANCE

NOVEMBER 1946

A McGRAW-HILL PUBLICATION

What the Factory Worker Really Thinks
How Industry Looks at Portal-to-Portal Pay

PRODUCTION

Statistical Control Cuts Scrap Cost 88 Percent

Gang Process Charts in Work Simplification

MAINTENANCE

Lubrication—Plant Operation Library No. 99

Some of the Newer Jobs Phototubes Are Doing

LABOR MANAGEMENT

Here's How I'd Revise Our Labor Laws, Says Reilly

Management Techniques in a Small Plant

FOR COMPLETE LIST OF ARTICLES SEE PAGE THREE

Here's why BYERS WROUGHT IRON resists corrosion

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FACTORY

MANAGEMENT and MAINTENANCE

NOVEMBER, 1946

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production • maintenance • labor management

DEPRESSION IN '47? . . . CONTROLS CAN BRING ONE *preceding page* 81
WHAT THE FACTORY WORKER REALLY THINKS—2. ABOUT UNION BEHAVIOR AND INDUSTRY EARNINGS 81
EDITORIALS 89
STRAIGHT-LINE PRODUCTION METHODS TREBLE FORMER OUTPUT 90
PUTTING A NEW BUILDING AROUND THE OLD 92
LAUNCHING A JOB EVALUATION PROGRAM 95
HERE'S HOW I'D CHANGE OUR LABOR LAWS, SAYS REILLY 98
STATISTICAL CONTROL CUTS SCRAP COST 88 PERCENT 102
CEMENT REPLACES BOLTS IN ANCHORING MACHINES 106
BETTER STORING LOWERS PRODUCTION COSTS 108
SMALL PLANT HAS MEALS BROUGHT IN 111
IMPROVED HANDLING REPAYS INITIAL COST IN 10 MONTHS 112
HOW INDUSTRY LOOKS AT PORTAL-TO-PORTAL PAY 116
700 ORDERS KEPT ON THE BEAM BY VISUAL SCHEDULES 118
SOME OF THE NEWER JOBS PHOTOTUBES ARE DOING 120
WHAT THE PRODUCTIVITY CONFERENCE DID 123
GANG PROCESS CHARTS IN WORK SIMPLIFICATION 125
MULTIPLE BUS FOR EASY WELDING 128
CARTOONS GIVE TECHNICAL INFORMATION TO SUPERVISORS 130
GOOD HOUSEKEEPING UNDER DIFFICULTIES 134
MANAGEMENT TECHNIQUES IN A SMALL PLANT 136
AN EFFECTIVE STEAM TRAP MAINTENANCE PROGRAM 140
PHOTOGRAPHS OF SCALE MODEL LAYOUT SIMPLIFY PLANT CHANGES 142
LUBRICATION—*Plant Operation Library No. 99* 145
WHAT'S AHEAD IN LABOR 157
WHAT'S AHEAD IN BUSINESS 158
MOTOR RECORDS USED BY BOTH PRODUCTION AND MAINTENANCE 159
CANADIAN WAR PLANT MULTIPLE TENANCY 294

departments

OPERATING SHORTS *(outstanding methods briefly reported)* 160
MATERIALS HANDLING EQUIPMENT REVIEW—III 166
WHAT'S NEW IN EQUIPMENT 172
YOU WANT TO KNOW 228
SIGNIFICANT LABOR DEVELOPMENTS 238
THEY SAY AND DO 260
BEHIND THE BYLINE *(facts about* FACTORY'S *authors)* 290
BOOKS AND BOOKLETS 302
ON THE CALENDAR *(national meetings for plant operating men)* 306
CATALOG SERVICE *(announcements of manufacturers' literature)* 314

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FACTORY
MANAGEMENT AND MAINTENANCE
A McGRAW-HILL PUBLICATION

november, 1946

Second and concluding article –

what the factory worker really thinks

about union behavior and industry earnings

FACTORY'S THIRD ANNUAL SURVEY **of the opinions of workers in the manufacturing industries shows that workers believe:**

- **Some national union leaders hurt unions by demanding too much**
- **John L. Lewis has hurt unions most by excessive demands, but he is also the leader doing most to help workers**
- **Prices, wages, and salaries of their companies are about right as a rule, but industry can raise wages now without raising prices**

The survey was made at this time to help leaders understand worker attitudes in the critical months ahead when the nation will need the greatest possible cooperation between management and labor in industry

summary of worker opinion

on union behavior

1. The worker thinks some national union leaders have hurt unions by demanding too much or calling strikes . . . he thinks John L. Lewis has hurt unions most . . . however, he also says this same John L. Lewis is the leader doing the most to help workers
2. The worker recognizes Communist influence in unions
3. He doesn't approve the use of secondary boycotts
4. He says to reduce strikes labor leaders should cooperate, be fair and square, and work for the rank and file

on industry earnings

5. The worker thinks his company's prices are about right . . . he believes the company pays fair wages as a rule . . . he thinks his bosses' pay is about right . . . but he is of two minds about the owners — they may get too much
6. He believes his own company can afford wage increases now . . . he believes, too, that all industry can raise wages without raising prices
7. Despite his feeling that dividends to owners may be too high, he wants 5 or 10 percent on money *he* invests

This is the second of two articles (the first was in October) based on **FACTORY's** third annual survey of the attitudes of workers in the manufacturing industries. This new nationwide survey, conducted for **FACTORY** by the McGraw-Hill Research Department, made use of the most modern opinion-measurement techniques. Interviews were allotted in proportion to geographical concentration of industry, type of industry, size of plant, age group, union affiliation, and sex. **FACTORY** therefore believes that the findings reported in this article (and in its predecessor in the October issue) are representative of factory employee opinion below the supervisory level.

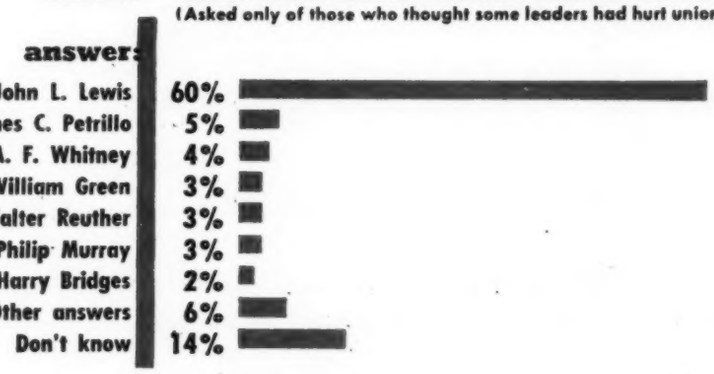
what the factory worker really thinks ABOUT UNION BEHAVIOR

1. the worker thinks some national union leaders have hurt unions by demanding too much or calling strikes . . .

QUESTION: *Do you believe some national union leaders have hurt unions by demanding too much, calling strikes, or by other actions people did not like?*

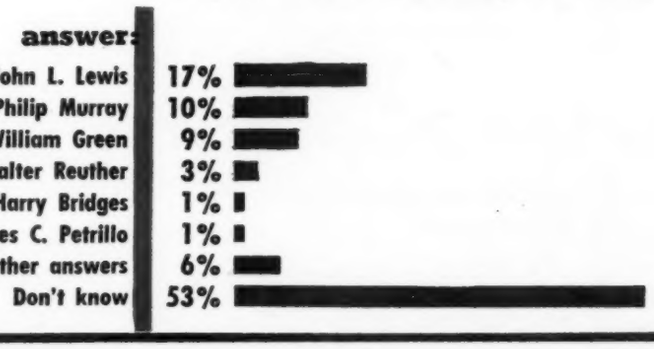
. . . he thinks John L. Lewis has hurt unions most . . .

QUESTION: *Which union leader has hurt unions most this way?*
(Asked only of those who thought some leaders had hurt unions)



. . . however, he also says this same John L. Lewis is the leader doing the most to help workers

QUESTION: *What top union man — among the national leaders — is doing the most to help workers get better wages, hours, and working conditions?*



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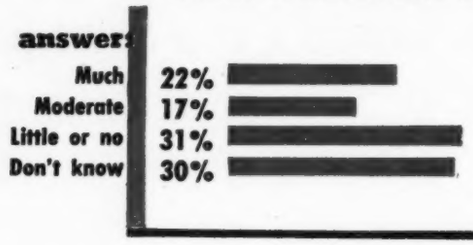
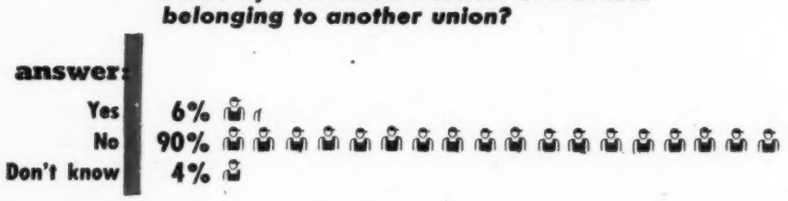
2. the worker recognizes Communist influence in unions

QUESTION: *Do Communists have much, moderate, or little or no influence in unions?*

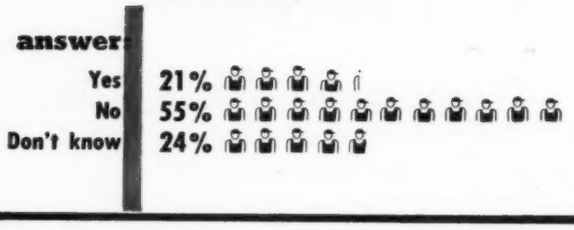


3. he doesn't approve the use of secondary boycotts

QUESTION: *Have you lost work because your union refused to handle or to install parts made by non-union workers or workers belonging to another union?*

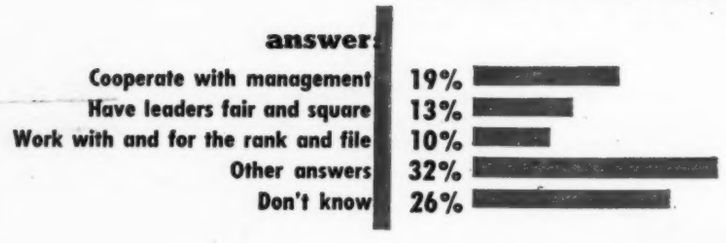


QUESTION: *If you had your say, would you ask members of your union to walk out in such cases?*

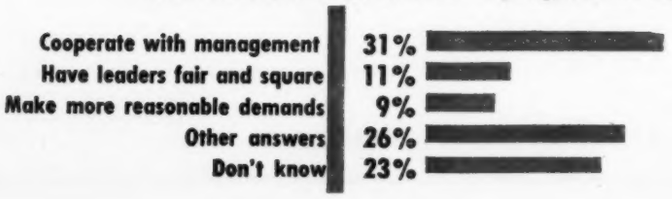


4. he says to reduce strikes labor leaders should cooperate, be fair and square, work for the rank and file

QUESTION: *In your opinion, what should the top labor leaders do to cut down the number of strikes and labor disputes?*

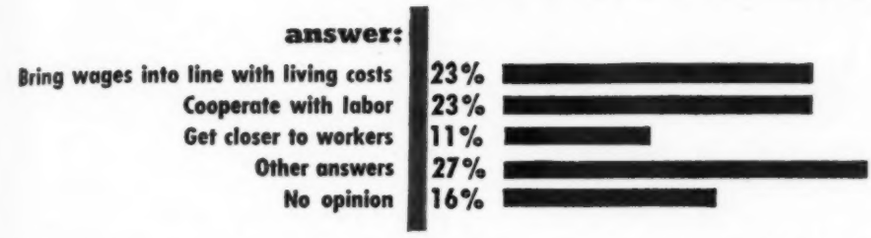

answer:
Cooperate with management 19%
Have leaders fair and square 13%
Work with and for the rank and file 10%
Other answers 32%
Don't know 26%

The same question — what should labor leaders do to cut down the number of strikes—brought this response in 1945:


Cooperate with management 31%
Have leaders fair and square 11%
Make more reasonable demands 9%
Other answers 26%
Don't know 23%

On the other hand, the worker thinks management, to do its part in reducing strikes, must bring wages into line with living costs

QUESTION: ***In your opinion, what should the top men in industry do to cut down the number of strikes and labor disputes?***


answer:
Bring wages into line with living costs 23%
Cooperate with labor 23%
Get closer to workers 11%
Other answers 27%
No opinion 16%

"Pay higher wages" rather than "bring wages into line with living costs" was how the worker phrased it last year. Other than that, his response to the question was about the same.

comment

With no help from coal miners, who were not included in FACTORY's survey of workers in the manufacturing industries, John L. Lewis is still rated the labor leader doing most to help workers, and also the leader who has done the most to hurt unions in public opinion. Workers hesitated in naming the leader doing the most to help them, and 53 percent of them would not venture any opinion.

That labor leadership has aroused some suspicion among workers in the last year is shown in the answers to the question: "*What should top labor leaders do to cut down the number of strikes and labor disputes?*" Leaders should work for the interests of the rank and file, say 10 percent of workers this year. Last year only a negligible few said they thought union leadership was getting away from its responsibility to the membership. In each group of workers, too, a substantial percentage say they think leaders should negotiate differences, not strike for trivial reasons, be responsible for their acts, forget politics, be reasonable, and make gains gradually.

Opinions about labor leaders varied widely by areas. In New England, for instance, only 8 percent — about one-half of those in other sections of the country — named Lewis the leader doing most for workers. Eighty percent of the Yankees nominated him as doing the most to hurt unions in public opinion, while only 52 percent of those in the Middle Atlantic states thought harshly of him. Lewis's vote on both questions, however, was more consistent across the nation than that given such men as Reuther and Thomas of the Auto Workers, or Petrillo of the Musicians.

what the factory worker really thinks ABOUT INDUSTRY EARNINGS

5. the worker thinks his company's prices are about right...

QUESTION: ***Do you think the prices your company charges for its products are too high, not high enough, or about right?***

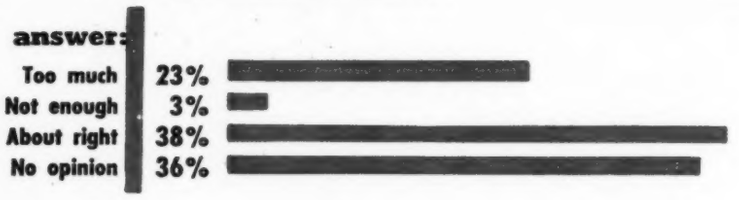
CONTINUED ON NEXT PAGE

...he believes the company pays fair wages as a rule...

QUESTION: ***Does your company as a rule pay fair wages?***

...he thinks his bosses' pay is about right...

QUESTION: ***Do you think the officers and men who run your plant are getting too much, not enough, or about the right amount of money?***



...but he is of two minds about the owners—they may get too much

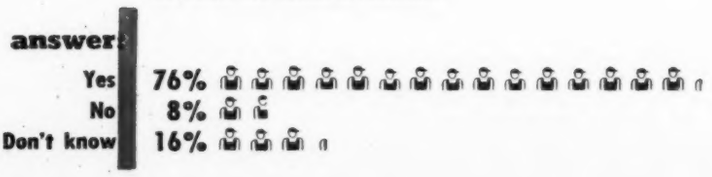
QUESTION: ***Are the owners or stockholders getting too much, not enough, or about the right amount of money?***

Noteworthy here is the worker's feeling that his company pays fair wages *as a rule* and that his company's prices are about right. But when asked if his own company could give workers a wage increase without raising its prices, three out of four workers say *yes*.

This seems to be the key blind spot in the worker's understanding of the economic facts about his job. Taken with the fact that 36 percent had no opinion about executives' salaries in their company and 51 percent did not know whether owners were getting a fair amount, it reveals the opportunity management has to win better understanding of workers by educating them in basic economics.

6. he believes his own company can afford wage increases now...

QUESTION: ***Could your own company give workers a wage increase without raising the prices it charges for its products?***
(Reported last month in FACTORY)

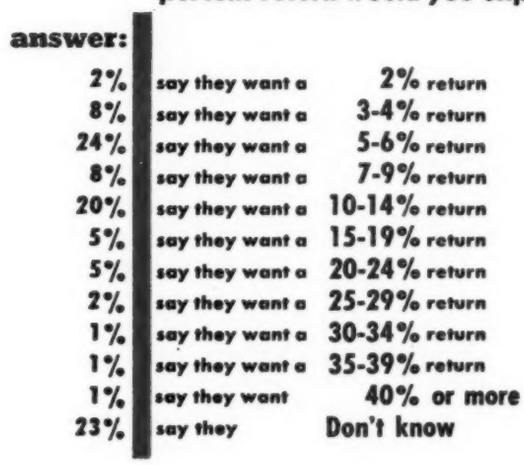


...he believes, too, that all industry can raise wages without raising prices

QUESTION: *Do you think that industry could give workers a wage increase now without raising prices?*

7. despite his feeling that dividends to owners may be too high, he wants 5 or 10 percent on money he invests

QUESTION: *If you put $5000 into a company, about what percent return would you expect each year?*


answer:
2% say they want a 2% return
8% say they want a 3-4% return
24% say they want a 5-6% return
8% say they want a 7-9% return
20% say they want a 10-14% return
5% say they want a 15-19% return
5% say they want a 20-24% return
2% say they want a 25-29% return
1% say they want a 30-34% return
1% say they want a 35-39% return
1% say they want 40% or more
23% say they Don't know

comment

New England may have an unusually large share of labor-management disputes in the future. New England workers are less inclined to think their companies' wages are fair. Only 57 percent of them say their companies pay fair wages, against an average of almost 80 percent of the workers in other sections of the country.

The survey also shows that 55 percent of New Englanders, compared to an average of 41 percent in the rest of the country, say there are more strikes, not fewer, ahead. New Englanders are less inclined to believe that not striking and increasing production will help to stop inflation. They are slightly more inclined to believe their companies can raise wages without raising prices also.

New Englanders, too, know less – or are less inclined to comment–about their companies' financial and wage policies.

Workers were quick to give their opinions on wages, and they knew enough of prices and of their bosses' pay to want to comment. But a majority – 51 percent – could not say whether or not the owners of their companies were getting a fair amount.

How management's failure to inform workers on financial policies has reacted, is shown in this question about owners' compensation. Twenty-five percent of workers think owners are getting too much. Only 22 percent think owners are getting about the right amount. Analyzing the response further shows that 25 percent of non-union workers and only 20 percent of union members believe owners are getting a fair return.

On the questions about their companies' prices, wages, and executive salaries, on which workers are better informed, substantial percentages of all groups agree with company policy. Non-union workers agree by larger percentages than do AFL or CIO members. Independent union members, however, show the highest approval, higher even than that of non-union workers. But even the members of independent unions give only 34 percent approval of the amount owners get are getting.

Workers' lack of knowledge about profits and dividends is further shown in the replies when they were asked what return they would expect on a $5000 investment. Most want from 5 to 15 percent. That, however, is well above the earnings of most bonds and stocks, to say nothing of industrial profits when earnings over a decade or so are averaged.

Put together, survey results show how management's failure to give workers financial facts or economic understanding leaves them wide open when an organizer claims they are being "exploited."

CONTINUED ON NEXT PAGE

differences in worker opinions

The union he belongs to, the size of his plant, the part of the country in which he lives — these are some of the key factors affecting what the worker thinks. To show the differences they make on certain questions, and to aid management in understanding worker attitudes, FACTORY presents these charts

small-plant workers are more conservative

The percentage of "yes" responses to key questions

	100 EMPLOYEES OR LESS	MORE THAN 100 EMPLOYEES
Company's prices too high?	19%	19%
. . . wages fair?	80	76
. . . bosses get too much?	15	25
. . . owners get too much?	18	27
Would you ask boycott?	15	23
Communists have much influence?	28	21

older workers lean toward the right

The percentage of "yes" responses to key questions

YEARS	20-34	35-54	Over 55
Company's prices too high?	17%	21%	18%
. . . wages fair?	76	77	80
. . . bosses get too much?	21	23	27
. . . owners get too much?	24	26	25
Would you ask boycott?	24	21	16
Communists have much influence?	23	23	21

geographic area influences worker thinking

The percentage of "yes" responses to key questions

	NEW ENGLAND	MIDDLE ATLANTIC	EAST NORTH CENTRAL	SOUTH	WEST
Company's prices too high?	13%	24%	15%	16%	22%
. . . wages fair?	57	76	78	82	79
. . . bosses get too much?	33	25	24	17	18
. . . owners get too much?	25	28	26	21	18
Would you ask boycott?	20	24	22	14	21
Communists have much influence?	26	26	23	12	28

employee affiliation affects opinion

The percentage of "yes" responses to key questions

	CIO	AFL	INDEPENDENT UNION	ALL UNION MEMBERS	NON-UNION WORKERS
Company's prices too high?	23%	20%	15%	21%	13%
. . . wages fair?	75	74	85	76	78
. . . bosses get too much?	31	20	19	26	17
. . . owners get too much?	32	25	15	27	20
Would you ask boycott?	31	24	12	26	10
Communists have much influence?	22	18	17	21	18

FACTORY

MANAGEMENT AND MAINTENANCE

L. C. MORROW, Editor

Inventories and Bottlenecks

Anomalous though it is, high inventories are causing bottlenecks in production. Who has not wondered why it is that we have such extensive employment with so few goods reaching the market?

Large unbalanced inventories furnish part of the answer. Schedules for output are made, and balanced inventories are ordered. Then some parts of the orders cannot be filled. Those parts that are delivered pile up. Some of the materials are worked on. Thus there is a building up of inventories.

This troublesome condition multiplies itself. Some manufacturers have high and useless inventories of items of which other manufacturers have none, and *vice versa*. What good is a refrigerator cabinet or a washing-machine tub if no electric motor is available? What good the motor without the other parts? It is being proved that unbalance in inventories is likely to be quite as bad as buying and holding for price increases.

The realistic solution is the scheduling of production and the ordering of materials and parts around the scarcest item. Industry must guard against bottlenecking itself out of the market by reason of extensive inventories.

Is Industry Seeking Smaller Communities?

Decentralization of industry on a national basis may be taking place without advance planning on a large scale.

It is well known that some big companies—General Electric and Sylvania Corporation are examples—are spreading out their manufacturing activities only after extensive research and planning. The end result is a migration into the smaller communities.

What may be equally important, but not so definitely planned, is that some medium-sized and small companies are tending to get away from the large industrial centers. Such action has taken place under the observation of all of us. Why?

There are reasons that involve material things—lower prices for land, more room for single-story operation, more living room for workers, more parking space.

But back of these moves undoubtedly is the conviction expressed by the president of a nationally known manufacturing plant of medium size that people in the smaller centers are closer to realities and understand that they cannot have what they do not produce.

There probably is much truth in this executive's belief that the man who lives in the city loses sight of the fact that someone has to accept the responsibility for producing the food and clothing that he consumes, the shelter that he enjoys, the transportation, amusements, communication, and other things that he makes use of daily.

The nation will be fortunate if the movement away from the big centers continues. It is needful in our economy that everyone who works shall fully understand that high standard of living depends upon what is produced; that low output per man-hour of work is inimical to the creation of plenty; and that higher and higher prices brought about by higher and higher costs end up in the sharing of poverty rather than plenty.

Good Maintenance a Necessity

Management executives are realizing more fully the vital part maintenance plays in plant operation.

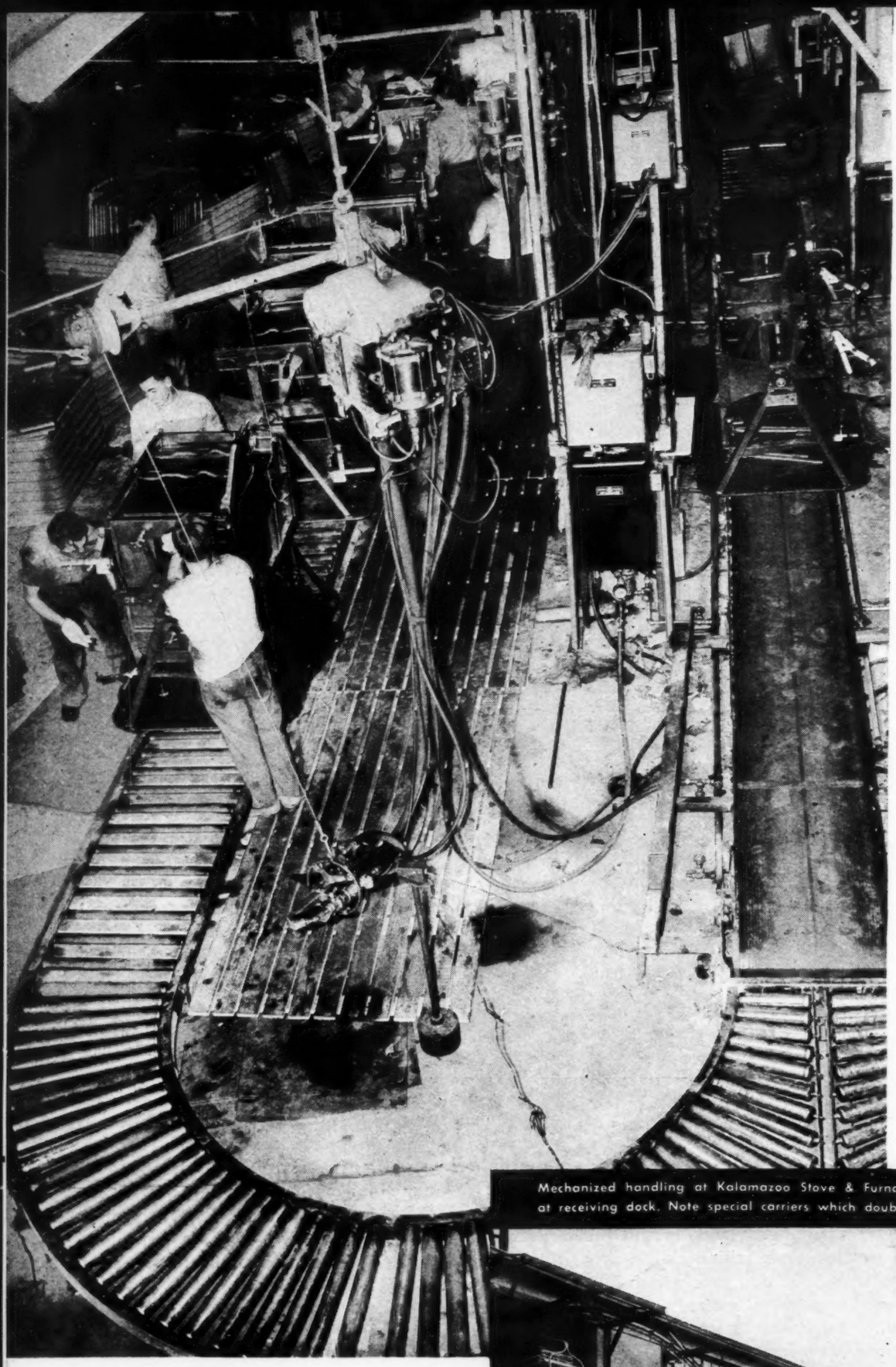
In many plants maintenance has long been a respected function. Management in plenty of other plants has had to learn the hard way that good maintenance is something that one can't take or leave, according to whim, without a penalty. That unpleasant truth is now getting a great deal of attention from the executives of a company that operates several plants.

During the past few years organized inspection and upkeep practically disappeared in these plants. Management was too busy getting out production to be bothered with the reasons for failures and delays. Now the books are full of orders that the neglected, broken-down equipment cannot fill.

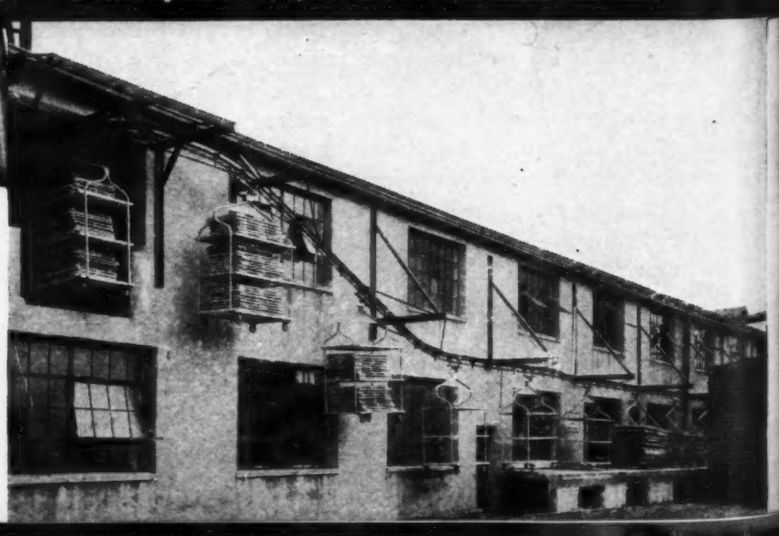
Recommendations of the experts whose help has been sought may well be followed by any other plants whose practices are not in line with them. These recommendations call for putting a competent man in charge of maintenance at each plant. He will have the authority and funds necessary to put the plant on its feet. Adequate budgets for maintenance, based on actual needs, will be worked out. A thorough-going preventive maintenance program will be instituted.

Management's stake in good maintenance is growing ever greater. There are several reasons why. As wage scales and the cost of equipment go up, so do the costs of production losses incurred by delays and failures. Only good maintenance can keep such delays down. Repair and replacement costs are higher. Proper maintenance can keep them within bounds.

Good public and personnel relations require that industrial plants be well kept up, good to look at, and good places to work in. That, too, is primarily a matter of good maintenance.

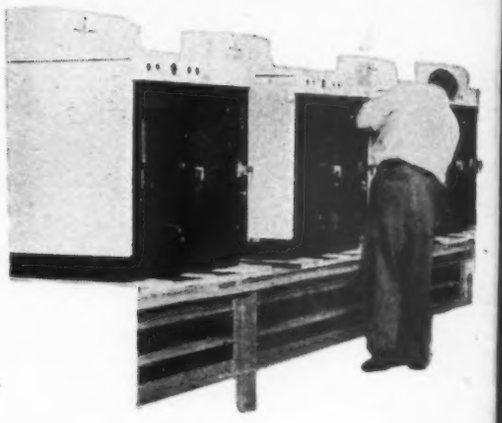


Stove parts are assembled in fixture and welded on figure-eight conveyor. Assembly is removed at end of loop to overhead chain which moves it to japanning room. Fixture is returned via belt-driven section in center of "eight" to beginning of line



Mechanized handling at Kalamazoo Stove & Furnace Company begins at receiving dock. Note special carriers which double floor trucks

STRAIGHT-LINE METHODS TREBLE FORMER OUTPUT



ARTHUR L. BLAKESLEE • PRESIDENT AND GENERAL MANAGER, KALAMAZOO STOVE & FURNACE COMPANY, KALAMAZOO, MICHIGAN

Manual handling has been outlawed at our plant. Hand methods are *out*, mass production techniques *in*. The entire organization has been revamped for low-cost production.

The result? *Three times our pre-war output in the same number of man-hours!*

No magic was involved. A small amount of blood and tears and sweat, perhaps. Particularly sweat, but no more than any plant can well afford to spare.

Kalamazoo management simply came to the conclusion late last year that it would be impossible to carry out the company's expanded production program with existing facilities—and reached the very obvious conclusion that something had to be done. And something was.

First step was to select a group of engineers and key production superintendents and give them this full-time assignment—"to develop the most modern mass production shop possible without giving too much thought to first cost." Product engineers thereupon studied product design with a view to adapting it to mass manufacturing methods. Methods engineers designed simpler and better jigs and fixtures. Standards men subdivided and replanned operations so that work could be performed in the easiest and the best way. Supervisors from manufacturing departments revised production lines.

Step two was to submit preliminary plans to employees in order to enlist their help and get their ideas for further improvement. Meetings, in groups of 80, were held at a local hotel. A company executive described the objectives of the expansion and modernization program. An engineer then explained the production plan, using a large diagram and a scale model of the plan to illustrate his point.

EMPLOYEES HELPED

Employees, in short, were told all. Their help was specifically requested. Cash awards were made for acceptable ideas.

It worked. Many employees stayed after the meetings to discuss plans in further detail. The result was a lot of ideas that helped to iron out many of the wrinkles that are almost sure to appear in any new plan of this kind.

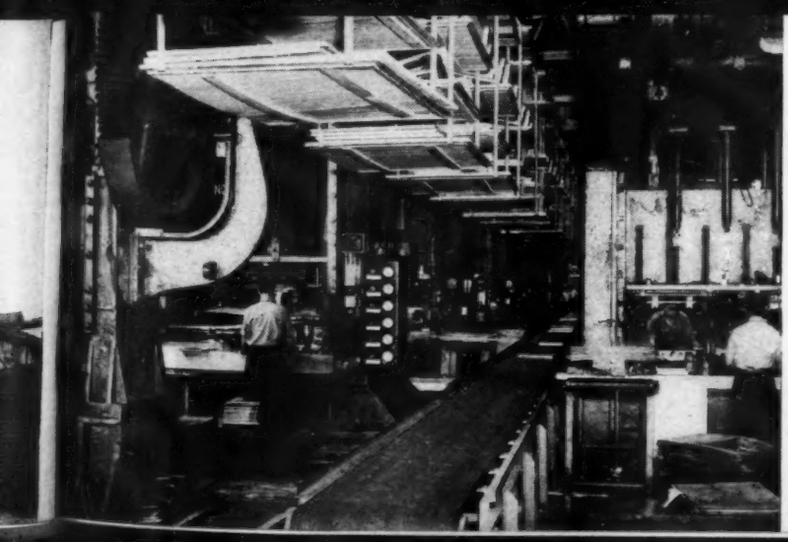
Out of it all has come the blending of assembly, enameling, pickling, pressroom, receiving, and shipping operations into one continuous production unit. Floor storage and handling have been minimized. Operations have been broken down into component elements. It all adds up to producing more than 1200 units a day on three assembly lines. Where there were no conveyors before, there are now 2⅓ miles of them.

Highlighted in the new manufacturing set-up is the "traveling stockroom" principle. The upper levels are used for storage conveyors, which means many thousands of square feet for production. Special five-tray carriers are used. The conveyors dip down at "take-off" and "put-on" stations.

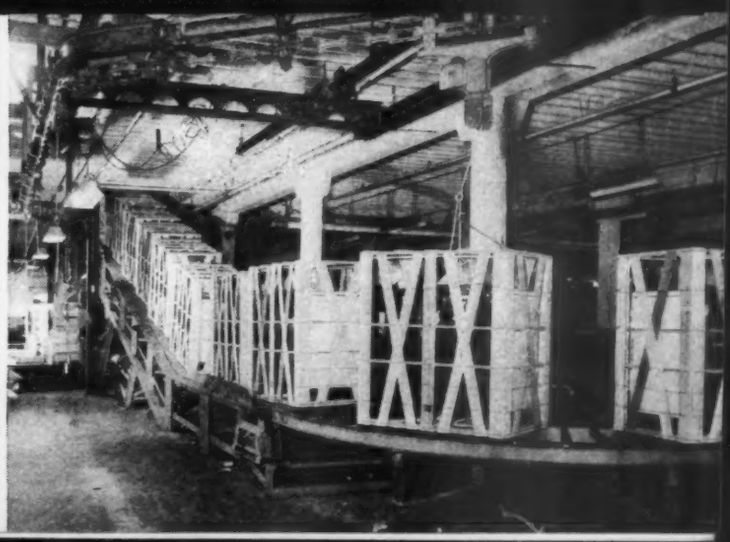
Another feature of the integrated conveyor system is a three-tray carrier, equipped with casters, which doubles as conveyor hanger and floor truck.

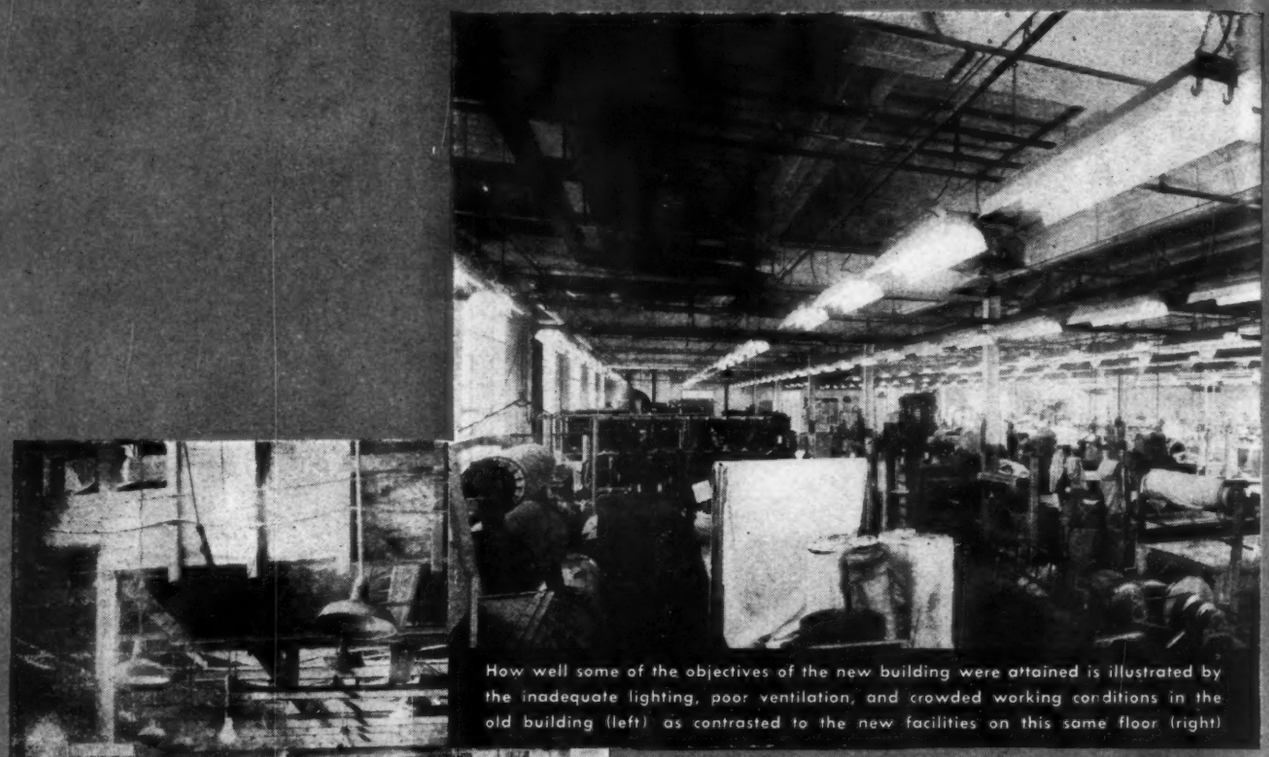
All this cost money. Close to $3,000,000, in fact. But it means better products at lower cost which more and more people can buy. And that, it seems to me, must now more than ever be the goal of every plant in the manufacturing industry.

Storage conveyors circulates in upper regions of press room while belt moves stove parts through press operations



Crated stoves move up to second floor, are there transferred to belt conveyor and carried off to storage





How well some of the objectives of the new building were attained is illustrated by the inadequate lighting, poor ventilation, and crowded working conditions in the old building (left) as contrasted to the new facilities on this same floor (right)

PUTTING A NEW BUILDING AROUND THE OLD

HARRY E. FRITZ, JR. • SUPERINTENDENT, QUAKER RUBBER CORPORATION
PHILADELPHIA

Front-corner view of Quaker Rubber's new two-story brick-and-steel building (right) shows tremendously improved appearance over the old single-story wood building (left) around and over which the new building was built with only minor loss in production

Erecting a new building around and over an old building isn't a method usually recommended or adopted when more and better plant facilities are wanted. But it is sometimes necessary—as, for example, at Quaker Rubber, which decided on this method as the only way of adding floor space with least interruption to production in several of its more important manufacturing departments.

FIRE HAZARD

Also a factor in this decision was the condition of the old building, a single-story all-wood structure 200 feet long by 62 feet wide, with a monitor containing continuous runs of wood ventilating sash for most of its length. This construction not only constituted a fire hazard, but working conditions relating to light, ventilation, and worker conveniences did not come up, by far, to the rest of the plant. Crowded machinery, and equipment too, made it impossible to maintain the company's standard of cleanliness.

All these undesirable conditions were reflected, of course, in less efficient operation, and pointed unmistakably to the need for rebuilding this section of the plant. Furthermore, the outward appear-

By adding second floor to building, available space was doubled, thereby relieving the congestion inherent in the old single-story layout. Good seeing is insured by new fluorescent lighting system which gives 50 foot-candles at work level

ance of the old building impaired the favorable impression given by the other more modern multi-storied factory structures. But the company was faced with an ever-increasing backlog of orders in these departments, so that any temporary suspension of productive operations while rebuilding was untenable. The only solution was to continue operations in the old building while erecting the new building around it. And this is almost literally just what was done, except for minor interruptions which were localized, as will be shown.

FLOOR AREA DOUBLED

Because extra space was an important objective, the new building was made two-storied, thereby doubling the original floor area. Construction is of brick and steel, with a concrete floor at ground level, a maple floor on wood sub-flooring on the second level, and wood roof decking on steel beams.

Work was started in June, 1945, but current building material shortages and labor difficulties delayed completion of the job about six months, until May, 1946.

First the new wall foundations were dug, then concrete footings were poured, after which the brick sustaining walls were built up to the second floor level. At this point, holes were made in the old roof to insert necessary steel column supports at 20 by 25 feet spacing inside the building. Temporary horizontal overhead troughs were built in which to place the cross beams. Then the old roof was removed, in 25-foot sections at a time, and new flooring was installed as a covering to keep pace with the old roof demolition. Productive operations went on just the same except under the immediate area that was being worked on.

Once the new second floor covering was completed, there were no unusual construction problems encountered in completion of the building. New services, such as lighting, heating, and other piping, were installed as planned, and change-overs were quickly made during off-shift periods.

The new fluorescent lighting systems on both floors are suspended from messenger cables, and fixtures are powered through movable connections that slide in trolley-type ducts carried just below the cables. This arrangement also provides power at any point in the room for 110-volt hand tools for emergency repairs and the like. Six rows of two-lamp luminaires on each floor give an intensity of about 50 foot-candles at table height over the entire work area.

BETTER WORKPLACE

Thermostatically controlled unit heaters, ceiling-type, assure comfortable room temperatures in cold weather. Steel sash that open top and bottom contribute to improved ventilation. And by use of the newly added space on the second floor, changes in machine layout were made possible on the first floor that are solving the problems of housekeeping and materials handling in this formerly congested area. The over-all results have justified the company's belief that a better workplace improves worker productivity as well as the quality of the work.

LAUNCHING A JOB EVALUATION PROGRAM

G. H. METZ • WAGE AND SALARY ADMINISTRATOR, RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, CAMDEN, N. J.

"We're not sure we're getting our money's worth in labor costs—and we want to find out. How do we start?"

In launching its successful job analysis and job evaluation program at its Camden, N. J., plant, the Radio Corporation of America set a pattern which any plant, large or small, can follow in planning such a program for its own use.

Even though job analysis and job evaluation received a mighty boost during the war and competition is already helping to establish its use as an important peacetime management tool, there is no guarantee of success with a program. And because of the complexity of such a plan, it may be a year before the program develops to the point where it can be scored a success or a failure.

So—it is vitally important in using this double-barrelled approach for scientifically appraising labor costs to get the program off to a good start.

Like most other aspects of scientific management, a job analysis and job evaluation program is successful in direct proportion to the ability and "know-how" of the personnel assigned to it. Without fully qualified and adequately trained personnel, the program is fore-doomed, if not to failure, at least to limited success.

QUALITIES NEEDED

Job analysts must have a combination of qualities and knowledges that is both difficult to find and difficult to evaluate. The staff as a whole must know the plant in which the work is done; they must be good reporters and practical psychologists and engineers. But above all, they must know what job analysis and job evaluation is and can do, and, perhaps equally important, what it cannot do.

In addition to the technical qualities, the job analysts must have important personal qualities. Since this program must sell itself to supervision and the lower levels of management, it is important that the job analysts have a rare combination of aggressive alertness and pleasant manner, intelligence and the common touch.

LEADER KNOWS HOW

Where will you find such paragons? How do you recognize them? First of all, the "know-how" of job analysis and job evaluation must be found ready-made. The only way is to recruit an experienced professional who has participated in the installation of a program, or one who has had broad experience in a variety of occupational situations. He should be well versed in the theoretical approach to job analysis, and abreast of the latest developments in job evaluation.

This man will be the supervisory job analyst who will plan the program, set it in motion train and develop subordinate analysts, guide the program throughout, and plan and oversee the maintenance of the system.

The staff job analysts provide the knowledge of the plant essential to a detailed analysis. Recruiting line analysts from in-plant personnel will provide the balance needed to offset this lack of plant knowledge on the part of the supervisor.

The best groups of employees from which to select job analysts are those who are accustomed to dealing with the plant's occupations on a day-to-day basis. Industrial engineers, including timestudy and process engineers, employment interviewers, cost estimators, foremen, and, to a lesser extent, group leaders and timekeepers provide good raw material from which to shape job analysts. Less closely allied, but still worthy of investigation, are the groups such as accountants, budget analysts, and scheduling men. Of course, selecting men from these groups is merely an assurance that they have the required background. It is still necessary to determine whether or not they have the required ability.

Direct observation is basis of job analysis at RCA. Here a job analyst observes tasks performed by a cable assembler

The RCA-Camden plant has developed a battery of tests and an interviewing procedure which has proved successful in the selection of industrial engineers and has been applied to job analysts with equal success. The minimum standards both of experience and potential ability are listed in Table I.

Prospective job analysts who are

equal on other factors should be selected on the basis of breadth of in-plant experience. Men who are already familiar with most operations will be more useful than those who may score equally well on the test and interview program but whose experience is limited to one or two departments.

The question of how many job analysts are needed should be determined before the interviewing process is begun. The number depends in part on the type of operations involved. Chemical processing plants present job analysis problems different from those which occur in an automobile parts factory. Usually plants whose process is either comparatively simple or highly mechanized will require fewer analysts than plants whose product is complex or whose process has not been mechanized.

Another factor affecting the size of a job analysis staff is the breadth of operations. A shop which specializes in the manufacture and assembly of plastic molds will have fewer occupations than one which makes all types of tools. Keeping these factors in mind, it is possible to set up a "rule of thumb." This should be adjusted upward or downward in consideration of the complexity and breadth of the operations. See Table II.

If the plant has only 250 employees the professional analyst should be able to handle the analysis program himself or with part-time assistance. The length of time required to analyze and evaluate your jobs will depend partly upon the quality of the job analysis personnel, partly on the backing they receive from top management, and partly on the cooperation they receive from line supervision. For each size plant listed above, the staff indicated should be adequate to complete the job in approximately one year.

Having selected the correct type and the required number of job analysis personnel, the only steps remaining before actually launching the program are the designing of the forms needed and the training of the job analysts. A wide variety of job analysis forms have been developed in industry and by the Occupational Analysis Division of the Department of Labor. The exact type of form needed will vary with the character of operations and the type of job analysis.

The RCA-Victor division form is designed to provide maximum flexibility. Forms developed by other industrial organizations, such as U. S. Steel and General Motors, are highly detailed and compartmented to provide a specific space for the answers to the specific questions. A middle path between these two extremes is well represented by the forms used by the Occupational Analysis Division. Regardless of the type of form used, four essential kinds of data must be listed:

1. Identification information. This section identifies the job, its physical and organizational locations, its code or serial number, the name of the analyst, and the name of the foreman or supervisor who verified the content of the analysis for correctness and completeness. A brief summary of the job is usually included in this section.

2. Selection and placement detail.

Candidate taking the personnel test, part of the battery of tests used in selecting job analysts at RCA Victor's Camden plant

Table I. Qualifications for Job Analysts

	Supervisory Job Analysts	Staff Job Analysts
Direct experience	3 - 5 yrs.	0 - 2 yrs.
Allied experience	2 - 3 yrs.	2 - 3 yrs.
Mental ability		
a. Personnel Test[1]	Score 30	Score 26
b. School grades	B	C - B
c. Arithmetical Reasoning Test[2]	Score 10	Score 8
Personality		
a. Analytical mind	Excellent[3]	Good[3]
b. Ability to handle people	Excellent[3]	Good[3]
c. Ability at self-expression	Excellent[3]	Good[3]
d. Enthusiasm	Excellent[3]	Excellent[3]
e. Appearance	Good[3]	Good[3]

Table II. Ratio of Analysts to Employees

Employees	Supervisory Job Analysts	Staff Job Analysts	Clerical Help
250	1	0	1
500	1	1	1
1000	1	2	1
2000	1	3	2
3000	1	4	2
5000	1	6	2

[1] *Copyright, 1922, by World Book Company.*
[2] *Copyright, 1941, by Science Research Associates*
[3] *Rated on a six-step scale: Exceptional, Excellent, Good, Average, Fair, Poor*

One of the most important uses to which job analysis information can be put in addition to job evaluation is in the selection and placement of personnel for your plant. Certain types of information are needed to assist the interviewer. This includes education and experience required, special clothing and tools needed, and the physical requirements of the job. Some of this information is already listed in that needed for job evaluation.

3. The work that is done. This is usually written in functional order (for example, setup, operate, remove from machine, and pack) and is divided into a number of sections. An indication of the skill level required by each element and the percent of time devoted to it are customarily part of the work performed section.

4. The qualities and activities that the job requires the worker to have or to perform. Most job evaluation plans are based on an assessment of five types of requirements made on the worker by the job, although many plans subdivide these five elements. They are skill, mental effort, physical effort, working conditions, and responsibility. The information needed to evaluate the jobs is gathered under this section, usually called job requirements.

Training of the staff job analysts should be conducted by the supervisory analyst along lines which will tie in closely with the program he has planned and the requirements of the individual plant. In the Camden plant, a three week training period, combining classroom and on-the-job training, was highly successful. Basic theory is explained in a series of lectures followed by practice in job analysis, observation of an experienced analyst at work, and finally the writing of job analyses under guidance. The three week program is as follows:

SUBJECT	DAYS
1. Job analysis theory	2
2. Practice in writing job analyses	2
3. Observation of an experienced analyst	2
4. Analyzing a job simultaneously with experienced analyst and comparison of the results	3
5. Analysis of two jobs under the immediate guidance of the supervisor	4
6. Analysis of first job under ordinary supervision and a critical survey of the results of the training	?
Total	15

Formal classes are a definite part of job analysis training program at RCA. Here the author describes advantages of such a program to company foremen and supervisors

The jobs assigned for practice analyses should be selected with care. The first practice analysis written should be a job with which the prospective job analyst is already thoroughly familiar, preferably one he has performed, so that full attention can be devoted to the writing of a graphic picture of the job. Other jobs used in the training program should be graduated in difficulty. At least half a day should be set aside at the end of the training program for a detailed assessment of the knowledge gained to strengthen possible weaknesses.

INFORM SUPERVISION

The final step in the launching of the job analysis program is to convince the personnel coming in daily contact with the program of its usefulness. The first line of supervision should be informed of the program, how they fit into the picture, and their responsibilities in guaranteeing the reliability of job analysis information. This can be done by a series of lectures, a news letter, or a general meeting. Camden made use of the supervisory management conferences which are attended by foreman and supervisors of all levels. In these conferences the time was divided equally between a discussion of the program and a question period. Copies of the procedure on making a job analysis, which clearly indicated the importance of the foreman to the program, were distributed to the conferees.

Where the main body of workers whose jobs are to be analyzed are represented by a union, it is advisable to inform the union in advance of the objectives of the program and the method to be followed. A program similar to that which was prepared for the supervisory management conference was presented for the Camden Union officials and shop stewards. As a result of these two conferences, the Camden job analysis program received complete cooperation.

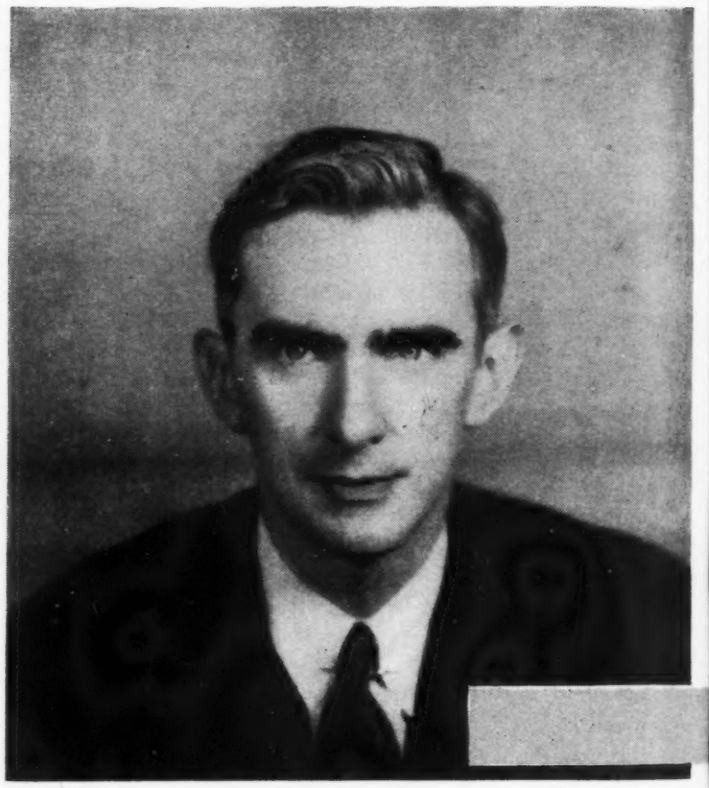
With trained analysts, fully informed on the techniques, working under an experienced job analyst and with cooperation from your supervisors and your employees, your program is half-way along the road to success.

HERE'S HOW I'D CHANGE OUR LABOR LAWS, SAYS REILLY

An exclusive FACTORY article by a former member of the National Labor Relations Board

The recent impasse between Congress and the President on labor legislation achieved at least one good result. Although the President vetoed the Case Bill and the House was not persuaded of the need for his emergency conscription measure, both the executive and legislative branches went on record as agreeing that our present labor laws are much in need of revision.

This should be regarded as a clear gain, because the pressing problem of finding a legal solution to some of our industrial relations difficulties had long been obfuscated by a school of thought which viewed the stoppages that have plagued the reconversion program as a passing phenomenon.



GERARD DENIS REILLY

GOVERNMENT IMPOTENCE

While there are no doubt many economic factors that contribute to industrial unrest, the most glaring defect in our governmental structure is the impotence of the Federal government in coping with situations in which the public interest of the country requires continuity of operation.

The only means of strengthening the hand of government is through Congressional action. Moreover, such action should not be directed at creating unnecessary appendages to the Conciliation Service but at the passage of laws carrying sanctions sufficient to be respected by both management and trade union officials.

Although no comprehensive scheme for solving labor disputes generally in a free economy can be advanced today, a starting point would be the prohibition of practices which by common consent contravene the spirit, if not the letter, of existing legislation. Under this approach, an examination should be made of the two statutes that are the foundation of national labor policy—the Norris-LaGuardia Act and the National Labor Relations Act.

In general, the effects of the Labor Relations Act have been sound. There is no doubt that wages and working conditions in the manufacturing industry have improved tremendously since employees have been enabled to negotiate through collective bargaining representatives. Moreover, because of the summary enforcement powers vested in the courts with respect to Labor Board orders, there has been created a large body of case law as a substitute for the anarchy that prevailed before.

Any sound plan for dealing with labor disputes should therefore be based upon a continuance of this quasi-judicial system. The Labor Relations Board, however, has had difficulty in securing public confidence largely because the only

sanctions in the Act applied to employers. Moreover, since the Board itself has the responsibility for prosecution of complaints as well as for decisions on the factual and legal issues posed by the hearings resulting therefrom, many litigants have felt that, once the initial step of issuing the complaint has been undertaken, the Board has already prejudged the case.

In actual practice, of course, such a feeling is baseless. Under its regulations the Board has delegated the authority to make investigations and to issue complaints, where the facts so warranted, to the directors of its 24 regional offices. Nevertheless, embarrassing situations do occur as a result of the Board's having this dual function.

During the early period of the war, the Kaiser shipyards entered into a closed shop agreement which was obviously questionable, since at the time of its execution there were not enough employees in the appropriate bargaining units to select a representative as defined by the Act. At a conference between a representative of the company and the members of the Board in Washington, the facts not being in dispute, officials of the company stated their view of the law. Members of the Board pointed out what they considered to be the illegal aspect of the transaction. Subsequently, the Kaiser lawyers moved to disqualify the Board members as prejudiced, and then, when notice of hearing of the complaint was issued, sought to enjoin the Board on this ground.

Although a Federal Court ultimately dismissed the bill for the injunction, this proceeding delayed the case for several weeks, and the attendant publicity created a widespread impression that the members of the Board had been guilty of some impropriety.

Occurrences of this sort emphasize the desirability of confining the Board to purely judicial functions. This could be done by relieving the Board of any responsibility for issuing complaints in unfair practice cases or notice of hearings in representation matters, through an executive order transferring the regional offices to a division in the Labor Department. Little would be lost in the way of coordination of Board policy with the actions of the regional officials, since the volume of cases reaching the Board has always been too great to enable the Board members to give the field anything but the scantiest kind of supervision.

The problem of making sure that orders of the Board are respected by labor organizations as well as by employers is a more difficult one. Under present judicial interpretations of the Norris-LaGuardia Act, there can be no injunctive relief in the Federal Courts against unions that refuse to process or transport goods made by another employer unless such employer signs an agreement to recognize their organization. Yet under the Labor Relations Act an employer can make a valid exclusive agreement only with the organization selected by the majority of his employees. The result is that, after an election in which the Board has certified one union, an employer may frequently find himself in the dilemma of either having to defy the Labor Relations Act by ignoring the certification or seeing his market taken away from him by the tactics of a rival union.

A recent example of such violations of the spirit of the Act by labor itself was the refusal of certain longshoremen belonging to a CIO union to unload certain ships arriving on the West Coast, manned by seamen belonging to the AFL.

One of the most aggravating stoppages in the manufacture of tanks during the war occurred in Detroit when a local of the United Automobile Workers called out all the employees in the Chrysler-Dodge plant because a firm making deliveries to a bottling concession was under contract with the Teamsters' Union.

The Teamsters in their jurisdictional fights with the Brewery Workers and with the CIO Cannery Workers have also employed such tactics effectively to compel producers to give them exclusive bargaining rights. In such circumstances the Board is powerless to give any relief to the employer who wishes to comply with the Act.

On one occasion the broadcasting

A Bostonian and a graduate of Harvard College and Harvard Law School, 42-year-old Gerard Denis Reilly worked as a Boston newsman and practised law before going to Washington in 1934.

Under Franklin D. Roosevelt, Reilly served as Assistant Solicitor of the Department of Labor, Administrator of Public Contracts under the Walsh-Healy Act, and then as Solicitor for the Labor Department. He was appointed a member of the National Labor Relations Board in 1941, retired recently, and is now practicing law privately in Washington. He is also a member of the Board of Legal Examiners of the Civil Service Commission.

industry was threatened with chaos as a result of a demand made by Petrillo's union that the studios employ union musicians to turn platters on recording programs. This operation had been traditionally performed as incident to the duties of broadcasting engineers who had a labor organization of their own which had been certified by the Board. Despite the Board's findings, however, the Musicians' Union carried on a war of nerves by threatening to withdraw orchestras from the principal sponsors of networks' programs. The major broadcasting chains yielded to this pressure and refused to bargain with the engineers. As a result the Board was compelled to cite them for an unfair labor practice and to go to Circuit Court of Appeals for enforcement of this order. On this occasion the Court threatened contempt proceedings against Petrillo as well as the companies unless there was compliance.

This protracted litigation might have been avoided if our Federal Courts followed the doctrine enunciated by the higher courts of New York and Massachusetts, which authorize injunctive relief against union activity designed to subvert a certification of a state board.

The Case Bill attempted to meet this problem by making injunctive measures generally available to employers aggrieved by secondary boycotts, but the President regarded such rights as too sweeping to be exercised by private individuals. A simple provision giving the Board authority to prevent third parties from interfering with its processes might have won his approval.

Another type of situation in which law-abiding employers should be entitled to invoke the Board for remedy arises out of strikes for other objectives repugnant to the Act. The principal issue upon which the United Mine Workers and the operators of bituminous mines reached an impasse last spring was the demand for a royalty on each ton of coal mined, to be dispensed by the union. The Wagner Act is explicit in forbidding employers to contribute any financial support to labor organizations; the Board has enforced this subsection vigorously, even holding that turning over receipts from cafeteria concessions patronized solely by employees, the giving of picnics to one labor organization at company expense, or the furnishing of office facilities for union purposes, came within this prohibition. Yet there is nothing in the law that forbids a union to strike for such purposes.

RECONSIDERING DECISIONS

During the war the Board held that a strike to compel an employer to put into effect a wage scale not approved by the War Labor Board justified the employer in discharging the strikers, but recent decisions have cast some doubt as to whether the Board will adhere to its earlier reasoning. In any event, withholding the remedy of reinstatement is hardly a solution to major strikes for illegal purposes, for the problem of replacing great masses of workers makes resort to disciplinary measures impracticable. Here again some kind of additional legal process would seem to be a necessary step to remedy this condition.

Another kind of strike with which it is difficult to sympathize is the strike to achieve an objective that could be realized by resort to orderly processes of the Act. Strikes for recognition fall in this category, for the Regional Offices of the Board are equipped to solve questions of representation summarily by the mechanics of secret ballot. Some of these strikes even arise in situations in which giving in to the strikers would expose an employer to a complaint case. The Board in recent years has held in several cases that, where one or more unions are seeking recognition and a petition is on file, it is an illegal act of discrimination for an employer to recognize one union rather than its rival in advance of the election.

Yet the motion picture industry because of a jurisdictional strike was tied up for two months last fall between the set decorators and the stage hands, the set decorators being successful in taking out all the mechanics and artisans at a time when a trial examiner of the Board was actually in the process of holding hearings to resolve the unit questions. The studios retaliated by discharging the strikers, but in the subsequent election their votes, as well as the votes of their replace-

How Reilly Would Overhaul The Nation's Labor Policy

- **Congress must strengthen the hand of government . . . by applying sanctions respected by both management and trade union officials.**
- **The National Labor Relations Board is embarrassed when it serves as both prosecutor and judge . . . its regional offices should be transferred to the Labor Department, the Board itself limited to its judicial function.**
- **There must be checks on use of secondary boycotts . . . there must be limits on the use of strikes . . . the Board should allow employers greater freedom to petition for elections on representation questions, should grant employers full freedom of speech short of threatening employees.**
- **Rights of foremen to unionize present a basic economic issue . . . Congress must give the question careful consideration to avoid unwitting endorsement of a revolutionary change in industrial relations.**

ments, were tabulated, although the companies had good reason—because of precedents developed in the illegal strike cases—to believe they could validly terminate the employment relationship of the strikers.

POSSIBLE REFORMS

The answer to such problems must ultimately be solved by the courts or by Congress, but there are two reforms the Board itself could make through its regulations which would make for a more even-handed kind of justice. The Act itself is silent on the procedure by which representation questions may be taken to the Board. For many years, however, the Board restricted the right to file petitions for elections to shop committees or trade unions. In 1940 this rule was amended to permit employers to file petitions if confronted by conflicting claims of competing organizations within the same plant.

There has been a certain justifiable hesitancy in giving employers this right where only one union is in the picture, lest an organizing drive be frustrated at its inception by employer insistence upon immediate elections. No good reason has ever been advanced, however, for denying employers a right of petition when the organizing group has already become strong enough to claim a majority and is threatening concerted action to obtain recognition. Under such circumstances the interests of the individual employees as well as those of the employer would seem to require that the issue be resolved by secret ballot.

One of the most absurd situations during the war might have been averted if the Board had had such a regulation. This was the seizure of the Chicago plants of the Montgomery Ward Company which was precipitated by the company's refusal to renew a contract or to bargain further, contending that the check-off figures showed that the union no longer possessed a majority status. The War Labor Board ordered a continuation of the contract for a 30-day period in which the union was supposed to file a petition. The company refused to extend the contract and a strike ensued, causing the War Labor Board to bring pressure on the White House to intervene with armed troops in order to vindicate the Board's position.

Subsequently the War Labor Board, in the Chicago Transformer case, adopted a policy that as long as no new elections were ordered by the Board it would continue to consider a union as the legal bargaining representative even though its contract had expired. The result was that many unions which had lost their majorities were adroit enough to avoid filing petitions, thereby securing a status to which they were not entitled under the Wagner Act.

Another change that lies within the discretion of the Board to put into effect relates to conduct during pre-election campaigns. At the present time there is nothing either in the law or in decisions of the Board that prevents unions from making defamatory remarks about employers in plants which they are seeking to organize, or from making the most exaggerated claims.

For a long time, however, the Board took a position that an employer had to remain neutral. In the last two or three years, as a result of decisions of the courts, the Board has recognized that certain employer utterances have fallen within the constitutional guarantee of free speech. The Board has abridged this right considerably, however, by viewing even a temperate speech as coercive if the employer delivers it in working time or if he has been guilty of an unfair labor practice, even though the speech was severable from such activity. Apart from any legal questions it would seem wise policy for the Board to refuse to intervene where an employer's arguments stop short of using threats of economic reprisal or discipline.

FOREMEN'S UNIONS

Another phase of the administration of the Wagner Act, which perhaps transcends all others in importance, relates to supervisory employees. The Board has changed its position on different occasions on the question of whether or not foremen are within the provisions of the Act, but the most recent line of decisions holds that the Act does cover them and that they can select even the union that represents the workers they supervise as their bargaining representative. Since the arguments for and against such a construction of the statute have been set forth at length in various majority and minority opinions, and are now being reviewed by the courts, it is unnecessary to discuss those legal issues here.

A PROBLEM OF POLICY

The problem before the country, however, is one of economic policy rather than interpretation of a statute. The decision relating to the bituminous mines of the Jones & Laughlin Company, for example, held that the United Mine Workers were entitled to organize even the supervisors authorized to negotiate with the mines for the rates of dead weight tonnage.

This determination is a plain invitation to all labor organizations to annex the foremen in mass production industry when they have always been regarded as the direct representatives of the employer. If the function of supervisor is generally to be subjected to the discipline of the labor movement, it will ultimately mean that for all practical purposes the labor unions will become independent contractors for production work.

Such a change would revolutionize our present conception of management's role in manufacturing enterprises. Congress and the Administration should scrutinize this controversial issue most carefully before unconsciously adopting such a far-reaching policy.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost productions: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 172) . . . a summary of **LABOR DEVELOPMENTS** (page 238) . . . things **YOU WANT TO KNOW** more about (page 228)

STATISTICAL CONTROL CUTS SCRAP COST 88 PERCENT

CLIFFORD W. KENNEDY • QUALITY CONTROL ENGINEER, FEDERAL PRODUCTS CORPORATION, PROVIDENCE

Scrap and re-work pieces down 88 percent. Direct inspection cost down 90 percent. Hours per unit improved. Production leveled out and increased. That's what happened when Federal Products Corporation took quality control *to the machines.*

The problem was *How to improve quality and decrease inspection costs.* The almost obvious answer was *statistical quality control.* But *what kind* of statistical quality control? And besides, everyone except the engineers seemed to have a definite aversion not only to charts and higher mathematics, but also to simple arithmetic and even pencils. The ultimate solution was found in a system based upon a "standard value of range," with the range "control" zones clearly marked right on the face of the gages used for inspection.

The plan was so successful that today it is in use in all departments—modified where necessary to meet different conditions, of course. This is how it works in the department where it was first installed for tryouts.

The job in this department consists of turning the diameter of a cylindrical hub located in the center of the web of a brass forging. Required diameter is 0.250 with an allowable tolerance of minus 0.002.

Preliminary studies showed that in spite of the fact that the operation is not fully automatic, the machines and tools were intrinsically accurate enough for the job. In terms of control, that simply meant that a satisfactory average range condition seemed obtainable with the tools at hand.

A gage capable of calipering the diameter of the hub or center bushing to the nearest 0.0001 was already in use. The operators had been in the habit of gaging single pieces at frequent but irregular intervals, and attempting to decide from such relatively haphazard sampling what action to take, if any.

First step in the new program was the addition of "control zones" on the face of the gage. The required tolerance limits are plainly marked, and in addition, red "control" bands are colored in adjacent to the tolerance limits. The bands can be seen in Figure 1, and their relationship to tolerance is shown graphically in Figure 5.

Actual determination of the proper control zones for a particular application is a matter for the statistical technician. Four factors must be known: (1) distribution of current production (see Figure 2); (2) allowable tolerance; (3) rate of production; and (4) desired average outgoing quality (admissible percentage of pieces outside tolerance limits).

SAMPLING PLAN

On the basis of these factors, the following sampling plan was found to offer the desired control: red control zones 0.2480 to 0.2485 and 0.2495 and 0.2500; check five pieces each twenty minutes. If the gage shows three or more of those pieces to be within the white segment between the red control bands, "accept the lot." In other words, continue production for another twenty minutes without adjustment and without further checking of the pieces produced in the preceding period.

If, however, three or more of the readings are in the red bands, the operator delays long enough to correct for the dimensional trend pointed out by the gage. Under these conditions, the foreman is notified and, usually, an inspector is called in to check the twenty minute batch just run and sort it, if necessary.

Whenever the needle swings completely beyond the control zones, corrective measures are taken and arrangements made to sort the pieces. Under these conditions, it may be desirable for the operator to check each of the first few pieces produced after such an experience. This is the practice followed whenever a new job is begun, or a new operator placed on the existing job.

As far as it goes, this program is satisfactory, but it does not as yet provide a sound basis for a *continuing review* of the results being achieved. To accomplish this, the operators were gradually indoctrinated with the meaning and importance of range. Then, with the addition of a pair of movable marking or indexing indicators on the face of the gage, it became a simple problem to accumulate the necessary data.

As the five readings are made, the operator sets one of these so-called tolerance hands at the point of highest reading, the other at the point of the lowest. Then, when the sample of five had been gaged, the range of that sample appears on the gage, easily readable as the calibrated distance between the two tolerance hands. For record purposes, this range is marked by a small circle on the "range" portion of the chart shown in Figure 3.

There is a statistical correlation between "range" and "process control," and it was found in this case that the process was statistically

FIGURE 1

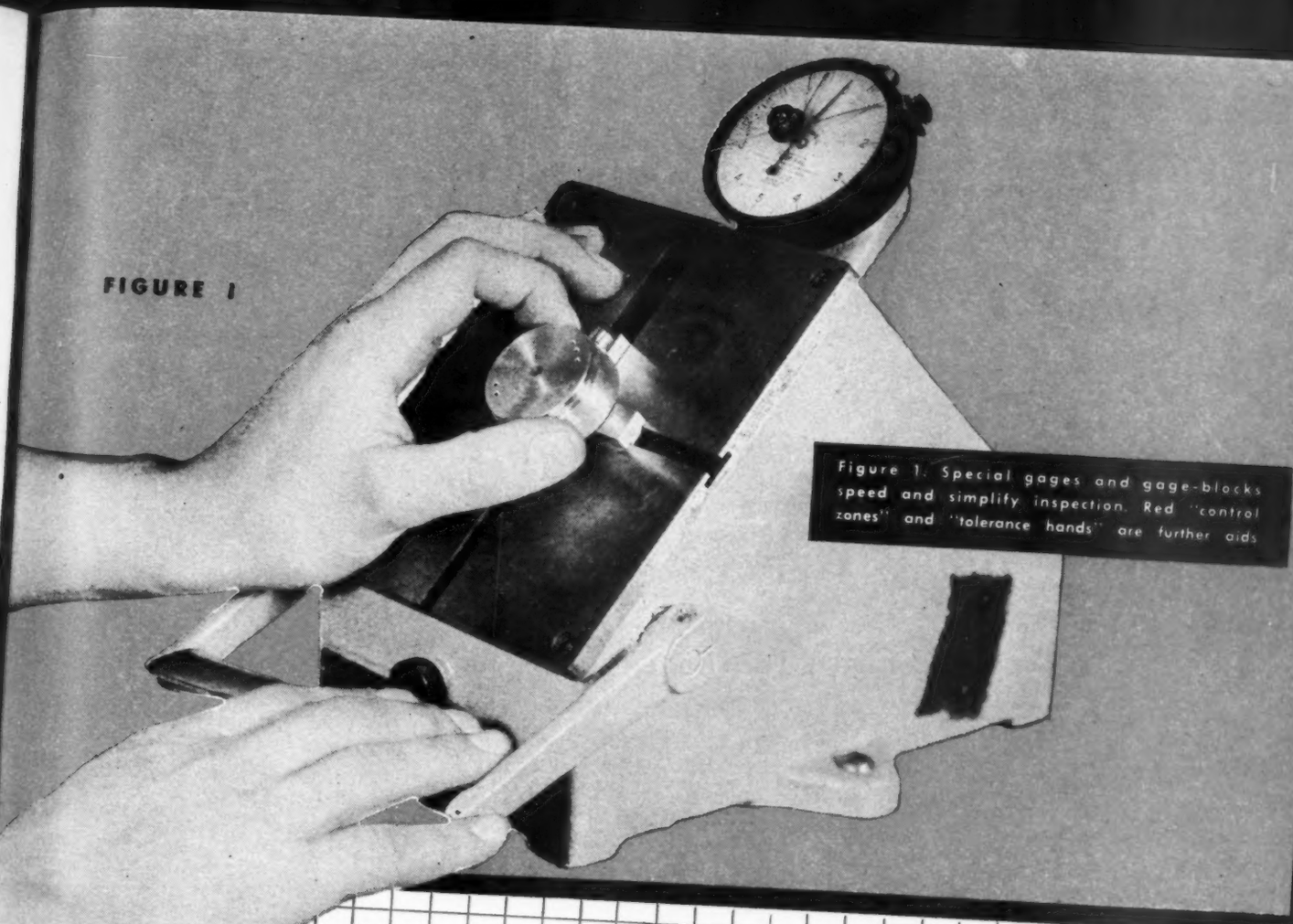


Figure 1. Special gages and gage-blocks speed and simplify inspection. Red "control zones" and "tolerance hands" are further aids

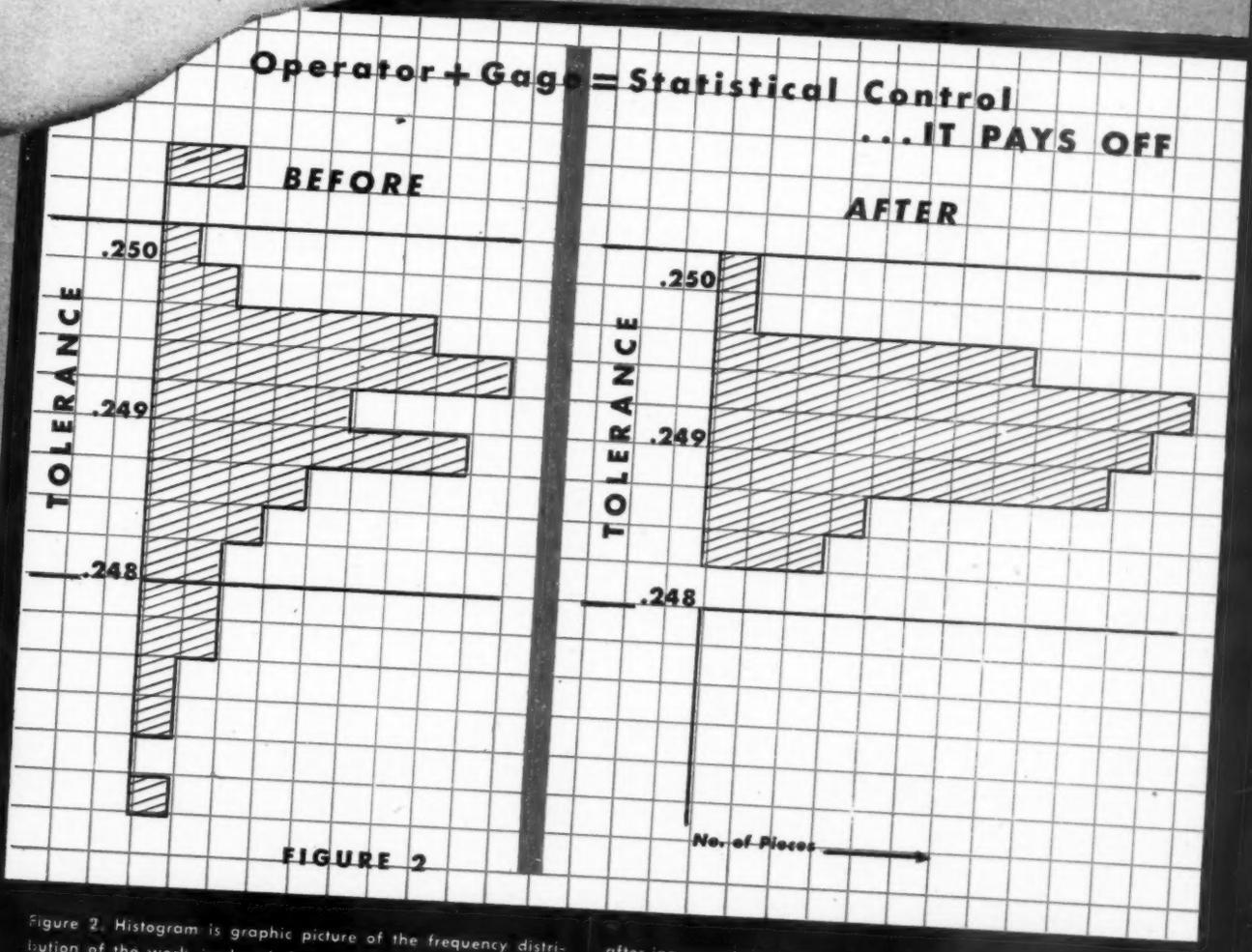


FIGURE 2

Figure 2. Histogram is graphic picture of the frequency distribution of the work produced. Samples of 50 taken before and after inauguration of operator gaging plan are classified by the number of pieces that turned up at each dimensional increment

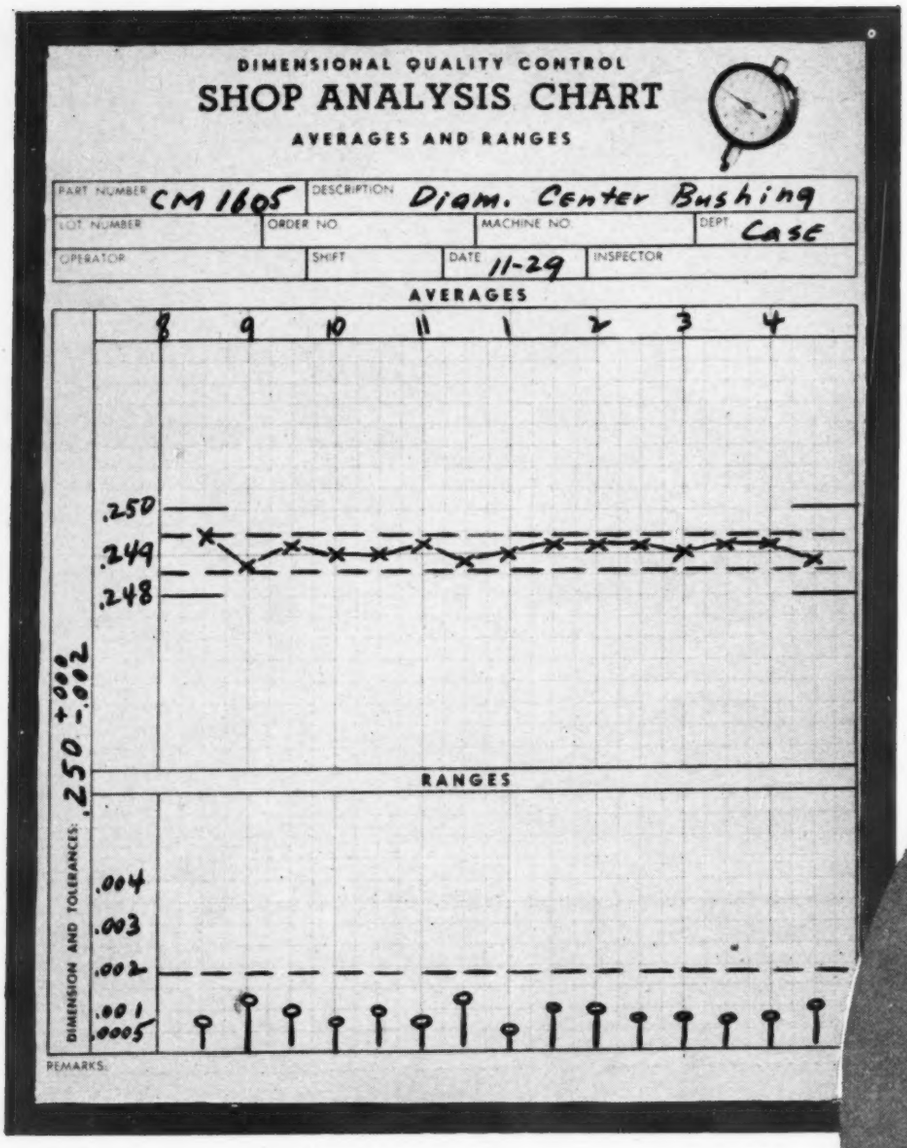


FIGURE 3

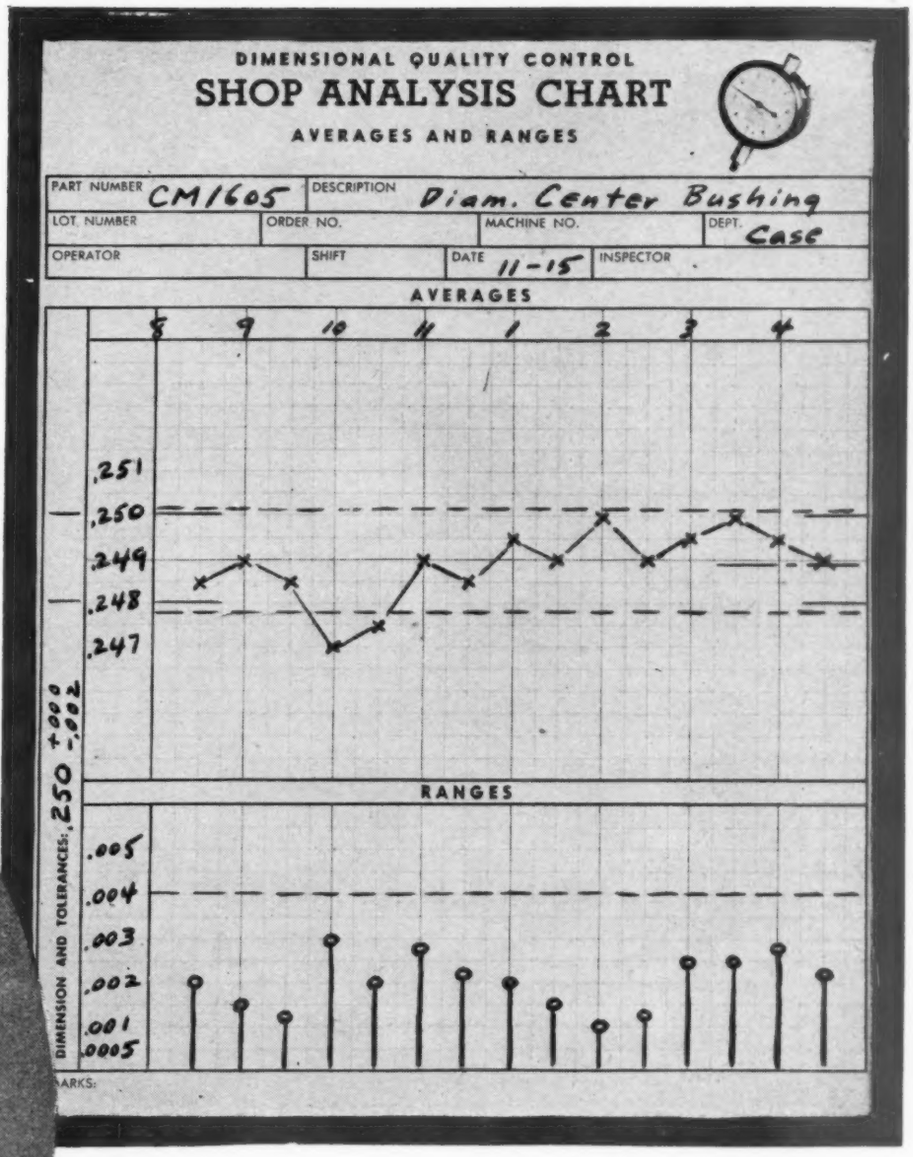
Figure 3. Samples of five are checked each half hour. Entries are made on basis of visual observation; no paper work is needed

"out of control" whenever the range of the five readings exceeded 0.0015. With this in mind, it can be seen that a casual inspection of the range chart will show if the process is out of control. It will not necessarily indicate that the process is *in control.* For example, a range of 0.0005 would indicate *consistency* of process, even if it lay between 0.2600 and 0.2605, but it certainly would not indicate *control.*

Thus one more check is necessary. This is provided by the broken line on the "average" portion of the shop analysis chart in Figure 3. Actually, it was found unnecessary to calculate a true average of the five readings taken. Rather, the "x" simply indicates the *midpoint value* of each group of observations. No paperwork is involved; the operator merely observes the position of the tolerance hands on the gage, and enters on the chart a mark denoting the midpoint between them.

Now, when the range is less than 0.0015 *and* the midpoint value of the readings lies within the control zone (0.2485 to 0.2495), there can be no doubt that the process is statistically under control. As the operators gained practice and experience, the analysis charts indicated that it was feasible to modify the sampling requirements. The charts showed, for example, that in most instances sufficient protection was afforded by sampling and gaging every half hour, instead of every twenty minutes, as at the start. On several jobs, sampling on a two-out-of-

FIGURE 4


DIMENSIONAL QUALITY CONTROL

SHOP ANALYSIS CHART

AVERAGES AND RANGES

PART NUMBER CM1605 | DESCRIPTION Diam. Center Bushing

LOT NUMBER | ORDER NO. | MACHINE NO. | DEPT. Case

OPERATOR | SHIFT | DATE 11-15 | INSPECTOR

AVERAGES

8 9 10 11 1 2 3 4

.251
.250
.249
.248
.247

DIMENSION AND TOLERANCES: .250 +.000 -.002

RANGES

.005
.004
.003
.002
.001
.0005

MARKS:

Figure 4. Analysis charts are maintained by the operators right at the machines. Note the variation *before* statistical control

FIGURE 5

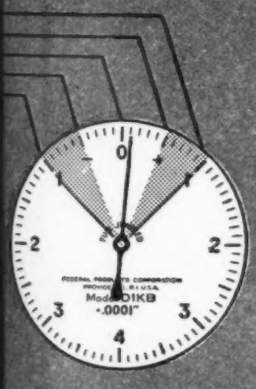


Figure 5. Width of control zones adjacent to tolerance limits is determined statistically. Three out of five in the white segment at top means "okay" on this operation. Projection lines show relation of gage to charts in Figures 3 and 4

three basis proved to be adequate.

What were the results of this statistical control? Part of the story is told in the accompanying diagrams—the part that deals with the improvement of quality of work *as it comes from the machine.* But there were other results fully as important as these.

Scrap and pieces for re-work in this department had been running at 14 percent. Shortly after the program was introduced, that figure had dropped to only 1.6 percent, a reduction of 88 percent. One spot check of 2000 pieces disclosed only 6 to be sub-standard, or only three-tenths of one percent.

The former routine inspection was continued for a while, along with the quality control charts which had been in use previously. But it was soon found that inspection could be reduced to not more than four patrol visits per shift, and then only to make a visual check on the range charts. A careful analysis showed that 90 percent of the previous inspection time and cost was eliminated. Time studies made in connection with this survey definitely established that the operator gaging plan did not, in the final analysis, merely amount to transferring an inspection cost to production.

Unit hours improved, production smoothed out and increased. But perhaps the most important gain accrued from the changed attitude of the operators and their renewed interest in the consistent quality of their output.

CEMENT REPLACES BOLTS IN ANCHORING MACHINES

ALBERT DEMSKY • SECRETARY, BERGER MACHINE COMPANY, MASPETH, N. Y.

The practice of mounting machines on felt pads and cementing them to the floor, instead of bolting them down, has resulted in several advantages and definite savings for the Berger Machine Company. There is, for example, a saving of about 75 percent in the time and labor formerly required to change the location of a machine. Noise and vibration have been sharply reduced, which means less wear and tear on machines and buildings. And it has been found that the machines require less maintenance in the way of keeping the bolts tight.

Most of the machines in this plant, approximately 400, are stamping presses, although there are a good many other machine tools. Weight of the presses ranges from about 1400 to nearly 16,000 pounds. Changes in location of machines are frequent.

Formerly it was the practice to fasten the machines down with lag screws, on wooden floors, or anchor bolts set in holes in concrete floors. One drawback was the need to drill new holes every time a machine was moved, and fill the old ones. Both operations took time and increased the cost of moving.

While plans were being made to move into a new plant, it was decided to try some other method of fastening machines down. Back of this decision was the desire to lessen the work of installing machines and shifting them around later on. Also, there was a natural reluctance to drill hundreds of holes in the new floors.

The method chosen for testing involved placing the machine on felt pads, coated on both sides with a plastic cement. The machine is cemented to the pad, and this in turn is cemented firmly to the floor.

A number of inclinable presses of different sizes were chosen for the first test. Individual motors had been mounted on these presses, but inability to obtain suitable brackets for the motors forced the use of some makeshift arrangements which, although entirely serviceable, tended to create a heavy overhanging load.

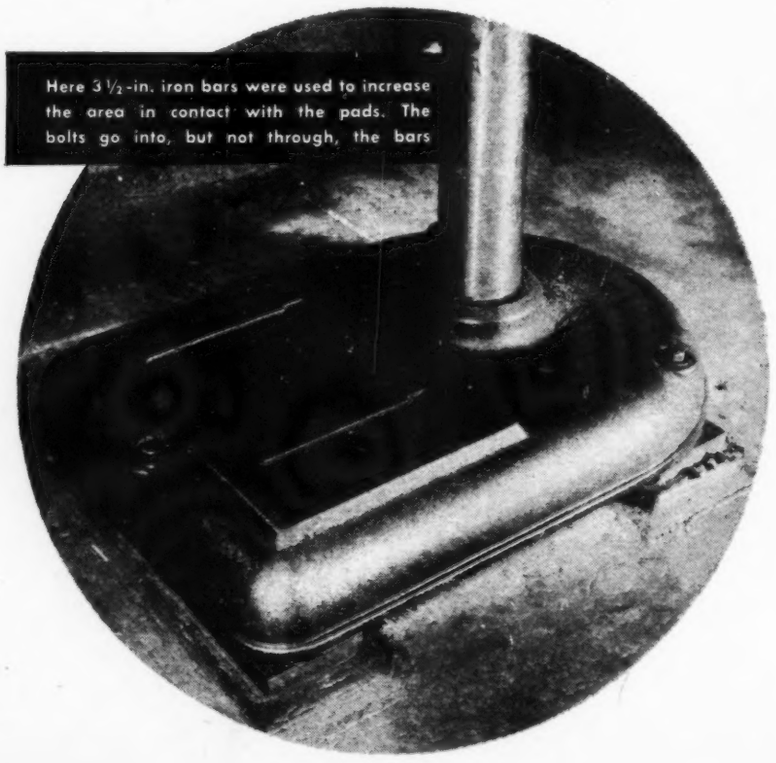
CEMENT PROVES ADEQUATE

Presses were placed on felt pads and cemented down. They were then watched closely for six months, but although they were working at top speed practically 24 hours a day, none of the pads pulled loose, nor was there any trouble resulting from cementing the presses down. On the other hand, there was a decided lessening of the noise and vibration.

When the move was made into the new plant, nearly two years ago, practically all the machines, large and small, were cemented down.

For heavy machines, or those that tend to cause excessive vibration, such as stamping presses, pads 1 inch thick are used. Pads ½ inch thick are satisfactory for light machines. Usual practice is to let the pads extend from ½ to ¾ inch beyond the base of the machine. With large machines several pads are used. One is put under the base at each place where there is a hole for a holding-down bolt. Such pads are from 6 to 10 inches long and from 4 to 6 inches wide.

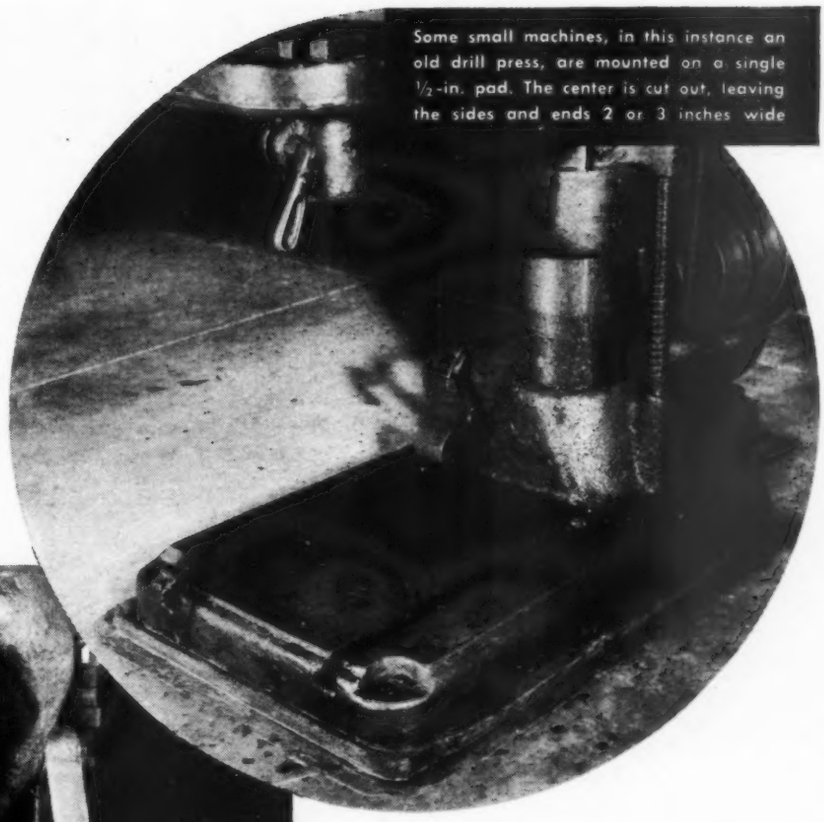
Some small machines, grinders and drill presses, for example, are mounted on a single pad that is



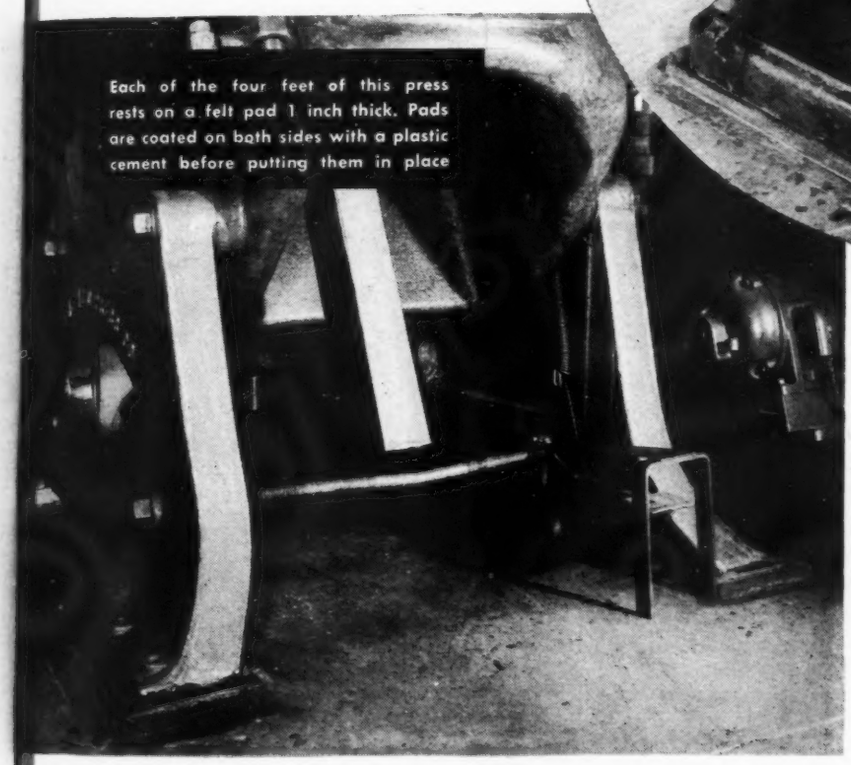
Here 3 ½-in. iron bars were used to increase the area in contact with the pads. The bolts go into, but not through, the bars

slightly larger than the base. In such cases the center of the pad is cut out, leaving the sides and ends 2 or 3 inches wide.

On certain other small machines, the bearing surface around the bolt holes in the base was considered to be of too small area for mounting directly on pads. Under these circumstances two flat bars, ½ inch thick, about 3 inches wide, and slightly longer than the width of the machine base, are placed on the pads, which are put at the ends of the base, and the machine is mounted on them.



Some small machines, in this instance an old drill press, are mounted on a single ½-in. pad. The center is cut out, leaving the sides and ends 2 or 3 inches wide



Each of the four feet of this press rests on a felt pad 1 inch thick. Pads are coated on both sides with a plastic cement before putting them in place

If the floor is greasy or oily, the spots where the pads are to be placed are cleaned with a suitable solvent. When the machine has been moved to the desired location, pads cut to the proper size and coated on both sides with the plastic cement are put in place under the base and the machine is lowered down onto them. The edges of the pads are then coated with the cement to keep them from becoming soaked with oil or water. The cement sets in 8 to 12 hours.

With the exception of shapers, none of the machines has required additional means of holding it in place. The rapid reciprocating motion of the ram of shapers tended to produce a slight to-and-fro motion of the machine, because of the resiliency of the mounting pads. This motion was eliminated by putting lag screws through the bolt holes in the base into the maple floor. Use of lag screws, however, does not lessen the vibration-damping effect of the pads.

When it becomes necessary to move a machine that has been cemented down, the cement on the pads must be softened by repeated applications of alcohol. Then a sharp floor scraper is used to pry up the pads and break the bond between pads, machine base, and floor. In the process the pads usually are destroyed.

Experience with the method of fastening machines down described here has covered a period of approximately two years. During this time there has been no instance in which a machine has pulled loose. Many of the pads are exposed to oil or coolants and become more or less soaked, but these materials seemingly do not affect the pads or the cement.

When it was the practice to bolt machines down, the average time required to install a machine in a new location was 6 to 8 hours. Much of this time was spent drilling new holes in the floor and filling up old holes. Now a machine can be moved and installed in about 2 hours. Last year 30 percent of the machines in this plant were moved to new locations. Hence the new method resulted in considerable saving in time and labor.

BETTER STORING LOWERS PRODUCTION COST

G. V. FLETCHER • GENERAL FOREMAN, THE BROWN INSTRUMENT COMPANY, PHILADELPHIA

Here is another approach by this company, to add to those already given in the March and August issues of FACTORY, for meeting the current problem of how to get lower unit cost of product. It may suggest familiar but nevertheless fertile sources for investigation

Right. Close-up view of special floor truck and bins shows use of peg boards, hole boards, chart drums, and sheathed tubing, to prevent damage in transit or storage. These and similar practices expedite handling in storeroom and shop

Below. Because of care in sequence of layout and in functional design of storage bins, order fillers can progress quickly from place to place in accumulating requisitioned parts. Special floor trucks with tiers of trays aid in reducing both handling and checking time. In the left background is a jar rack

Among the various operations recently probed at The Brown Instrument Company of Philadelphia for reduction of product costs was that of materials handling. In the face of pegged selling prices and ever-mounting labor costs, two possibilities for cutting handling costs were suggested:

1. Could anything be done to reduce the expense of indirect labor used in handling materials?

2. Could direct labor be more efficiently utilized for higher production by relieving it of handling operations?

The answers to these questions resulted in the following major changes devised to reduce costs:

1. Indirect labor in the stores department was reduced by ten workers at a monthly saving of about $2,000.

2. Operating efficiency in the machining and assembling departments was increased eight percent because of decreased handling.

Each of these achievements, except for the common and important factor of the adoption of special floor trucks to move material, were unrelated both in their development and in the methods used to bring them about.

Considering first the improvements made in the stores department, the problem centered in the necessity for storing and handling some 28,000 parts and subassemblies which go into the products of this company. Formerly, as a result of war expansion, these items were stored in four outside warehouse locations, and in three stockrooms within the main plant.

The first step toward economy was the centralization of all stores activities at one location, because it required less supervision, less operating personnel (3 workers less, not counted in the reduction of 10 already mentioned), and yielded a more efficient organization. Since insufficient area was available in the main plant for such consolidation, a five-story and basement warehouse with two elevators each of 8000-lb. capacity was leased and converted to this purpose. Despite the handicap of an outside location, with the necessity of trucking parts to and fro by scheduled auto delivery, this consolidation contributed basically to the final achievements. Trucking costs, incidentally, also were lowered by this move.

Great care was observed in planning the new centralized stores layout. Heretofore there was no uniformity in the geographical set-up of bin locations. This made it difficult for all but trained men to find parts. Related parts were scattered in various stockrooms. Often the same part would be stored in two locations, so that in attempting to fill an order, there was danger of showing "no stock" when only that in one location was exhausted. Moreover, when filling stock requisitions, order clerks piled material on flat skids which could not be moved about easily. Loss of time, errors in filling orders, and undue damage to materials were the penalties of these confused arrangements.

CAREFUL PLANNING

In the new set-up, definite principles for eliminating these faults were followed. First, layout of material was designed geographically in direct relationship to usage requirements, to bring about minimum effort of handling. For example, all raw materials and castings were stocked in the basement, because of weight in relation to floor loading and for convenience in handling.

Next, methods of storage were radically changed, as depicted in these illustrations, for ease in handling, faster storekeeping, better housekeeping, and to minimize damage. Home-made shelving and bins were discarded for functional storage equipment. For example, castings that formerly had been stored in boxes of various sizes and shapes stacked on their sides to a height of 6 feet, were placed in specially constructed narrow shelf bins, with lighter castings near the top. The castings no longer spread all over, but remain neatly stacked in place.

The old racks for rod stocks were made of wood uprights, 6 feet high, with the conventional steel rollers at various levels between the uprights. Handling stock in or out was difficult, and marred or caused blemishes on polished surfaces. Sheet stock was stored in the original packing cases on the floor. For these types of materials, new open-side racks were designed.

Innumerable sizes and types of paper instrument scale blanks, instead of being piled horizontally on top of each other, were placed in separate vertical compartments similar to phonograph records. Finely finished gears that formerly were piled together in deep trays are now first separately packed in wax-paper bags. Tiny screws, wires, washers, and such are stored nu-

For storage of bulk items that cannot be placed on shelving, part of one floor is laid out in blocks, which are arranged as nearly as practicable by part numbers in numerical sequence

merically in metal-capped glass jars, all of one size, kept in individual spaces on an open-faced wood rack.

As a final step in the program, new handling equipment was purchased. A number of special floor trucks that already had proved highly efficient for materials handling in the manufacturing and shipping departments were secured to replace the platform skids. Such a truck consists of a low platform of about 5 square feet area, mounted on five double-casters, and bearing a vertical notched 5-ft.-high framework capable of holding up to eight rack trays, one above the other, for a capacity of 2000 pounds. Total carrying area of such a truck averages about 30 square feet. In addition to these trucks, an electrical lift truck was purchased for stacking material, thus providing more efficient utilization of floor space.

HOW IT WORKS

As a result of these combined improvements, considerable time is now being saved in the centralized stores department. The routine is as follows: When the production control department releases a bill of materials to stores (but not until all material is known to be available), it prearranges the requisition in numerical order as far as possible to follow the "consecutive number" layout of the new storeroom.

The requisition goes to the indexing clerk who fills in, after each part, the location by floor number and bin number. It is now turned over to the order filler, who obtains a special floor truck with empty rack trays, and proceeds with truck from aisle to aisle, and floor to floor, until he has filled the order. The truck is then pushed to a checking area where the group leader checks the accumulated material against the requisition. After this check, the truck is taken to the designated shop area in the main plant.

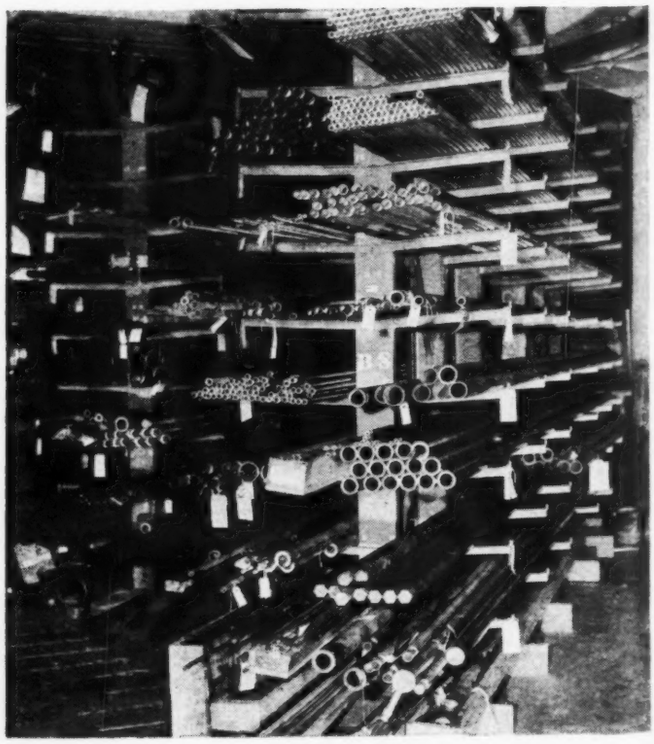
The reverse operation of placing parts and subassemblies from the shop or vendor into storage is handled in the same way. In short, the geographical layout of stores, the functional design of bins and racks, plus the ability to move the special trucks at will to all locations, has insured a smooth, fast flow of material into and out of the warehouse. And, incidentally, it has simplified the training of new order-fillers.

The changes in methods that increased direct production efficiency by eight percent can now be demonstrated. The delivery of parts and subassemblies in the special floor trucks to manufacturing and assembling areas, as just described, plus a continuation of the use of these trucks in these areas, has constituted the basis for reduction in handling by production workers. When parts formerly were delivered on platform skids to these areas, they either were put away in a temporary bin storage nearby, or if too heavy, were left on the skids. As soon as an operator was ready, the parts were removed from the bin, placed on another skid, and brought to the work station. Here the parts had to be transferred to benches or shelves because of shortage of floor space for skids. Subsequently the parts were taken from the shelves by the operator, and returned to skids or box trucks for rerouting to another department.

In the new method, parts remain in the trays of the special floor truck as they arrive from the stores department. The large storage area afforded by a single truck, plus its mobility and low floor-space requirements, gives several unique advantages. Work can be brought directly to the operator without all the previous rehandling. Also, a substantially larger quantity of work can be lined up and disposed of at one time. As a result, less supervision is required, and work is more easily checked before it is moved to the next operation. When necessary, rush work can be easily sandwiched between a stock run.

In the exercise of this program to cut handling costs other advantages have appeared. By the use of the functionally - designed trays and holders for delicate parts, rework has been reduced by 12 percent on parts as a whole, and by as high as 50 percent on certain highly finished pieces. Also of consequence, because space was at a premium, has been a reduction in the need for floor space for storage of the parts in the manufacturing and assembly areas by 15 percent.

Open-side racks, 10 feet high, are designed to hold all raw material stock, such as rods, tubing, and sheets, without damage to polished surfaces in putting in or taking out stock. Racks are parallel to each other, but at a 45-deg. angle to the aisle, making all contents both visible and accessible



Well-prepared food is ready for employees in the company cafeteria. The mobile restaurant's attendants do all serving and clean-up

SMALL PLANT HAS MEALS BROUGHT IN

A new method of in-plant feeding is in operation at the Barden Corporation, Danbury, Conn. A traveling restaurant, privately owned and operating from a central commissary, calls at the plant each day just before lunchtime. The mobile unit is equipped to handle 1000 ready-to-serve items, such as sandwiches, baked goods, hot drinks, dairy products, barbecue, casserole, and insulated hot plates.

Barden has turned over its cafeteria, which was run by the company during the war at a loss, for operation by the mobile restaurant's two attendants, who do all the serving and clean-up for the feeding of the company's 200 employees.

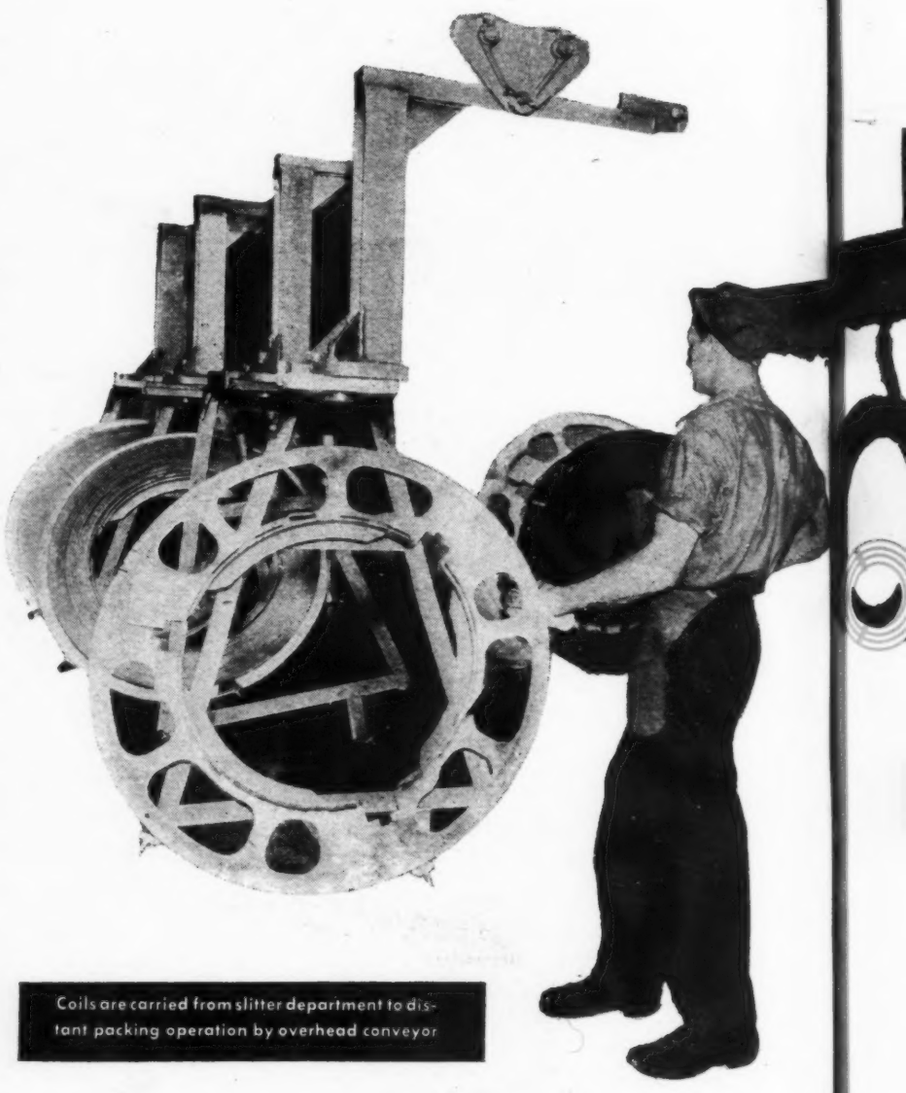
Just before lunchtime, the mobile unit rolls up to the door of Barden Corporation's cafeteria and attendants carry trays of food, ready to serve, into the building

IMPROVED HANDLING REPAYS INITIAL COST IN 10 MONTHS

C. LEE DRYDEN • CHIEF PLANT ENGINEER, SIGNODE STEEL STRAPPING COMPANY CHICAGO

Four times the former output per man-hour is the impressive record hung up this past year in the Signode packaging department. It was made possible through the installation of a conveyor system which moves heavy coils of steel strapping from slitter lines through wrapping operations to shipping platform or storage area.

Savings the first year added up to $24,000. The initial investment was returned during the first ten months of operation.



Coils are carried from slitter department to distant packing operation by overhead conveyor

THE PROBLEM

Two slitter lines with a monthly production of 9,000,000 pounds of steel strapping were being bottlenecked. The shipping room had had to be moved to another building over a block away in order to free plant area for a sudden increase in production schedules. This added thousands of feet of trucking to an already overcrowded fleet of power trucks. And to complicate the problem, there was a transfer point where pallets had to be raised to a higher floor level through a hole in the wall of the second building. Another truck then picked up the load and moved it on to the shipping room.

THE SOLUTION

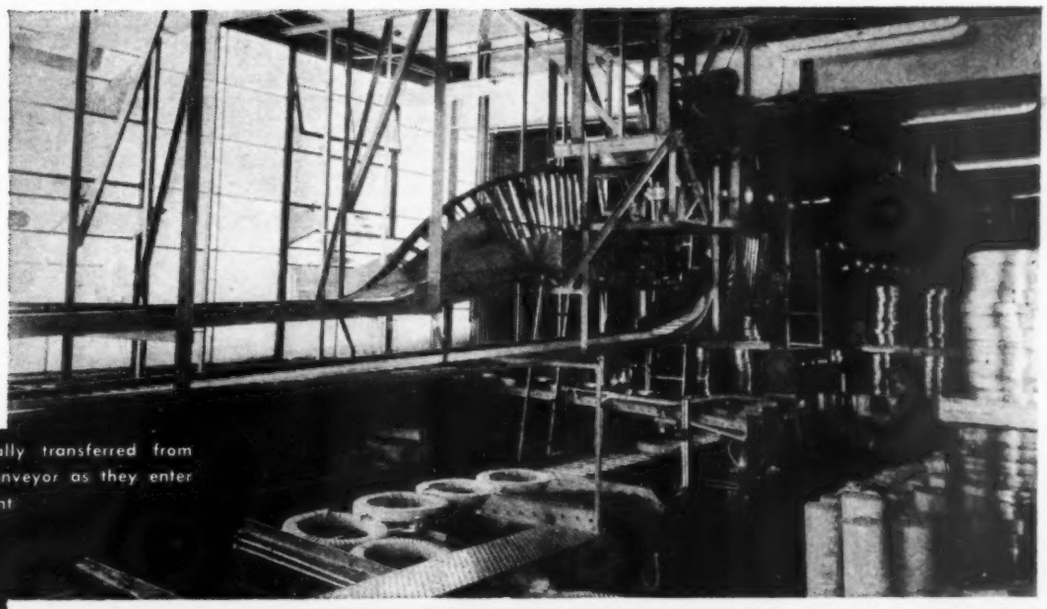
Two overhead conveyors move coils from the distant slitter lines to the packaging department. At this point the coils are automatically transferred to two roller conveyor lines marked A and B on the diagram on page 114.

The system works like this:

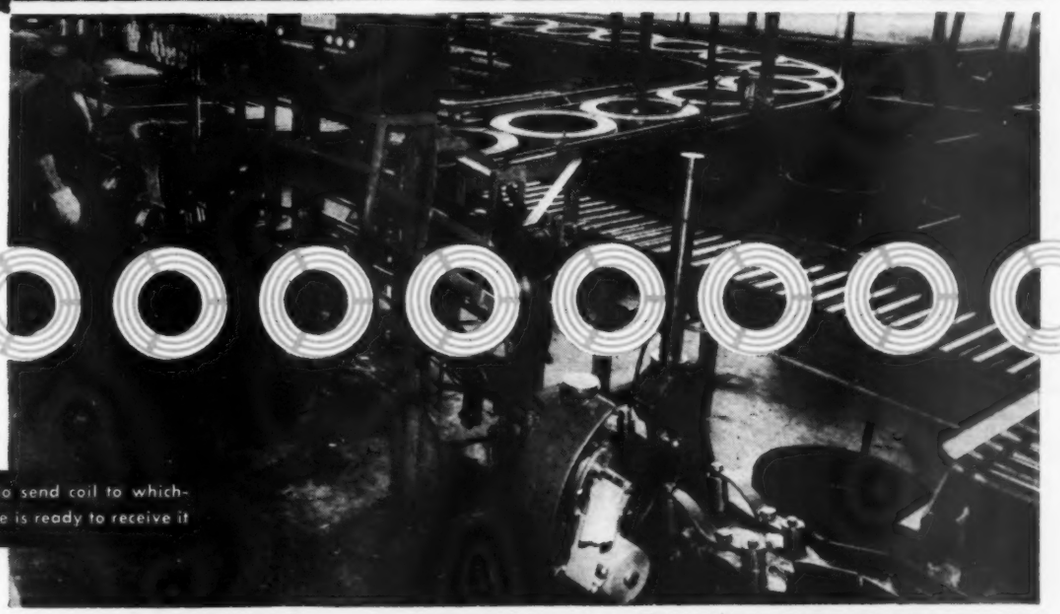
Powered belt on first section of roller conveyor moves coil along while the overhead conveyor (moving at the same speed) slants downward; hook on which coil was carried disengages as overhead makes 180-deg. turn for return trip. As coil leaves belt, gravity carries it along roller conveyor and around corners to the upenders.

Length of conveyors is sufficient to provide a production buffer or "float." Intermittent delivery to the line is thus evened out and a smooth, regular flow is provided at the start of the actual packaging operation. Difference in the length of conveyors A and B compensates for the fact that production on slitter line B is twice that of slitter line A.

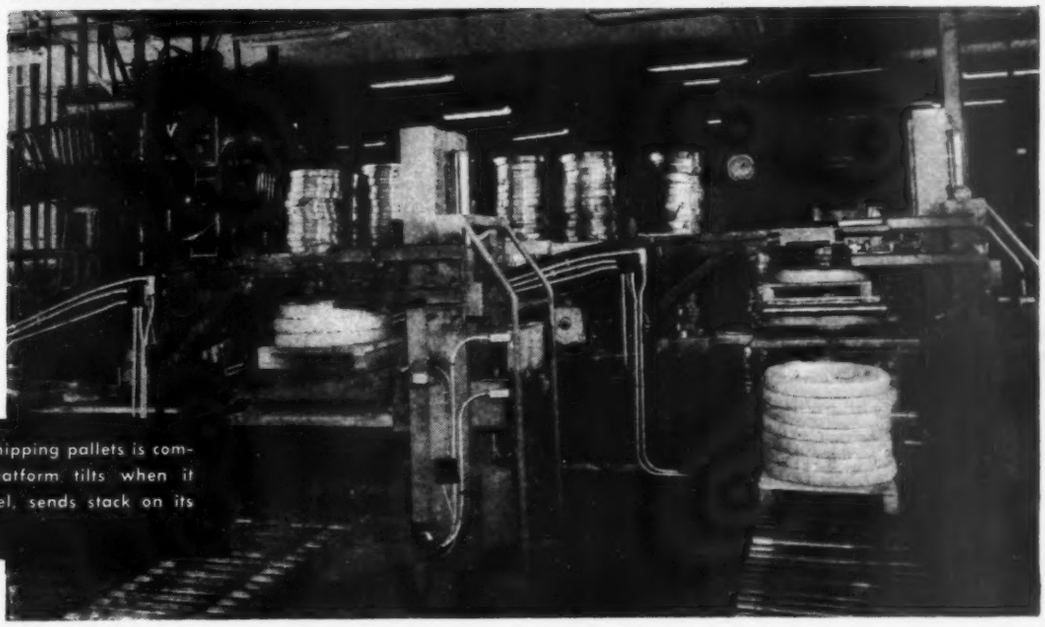
As coil is upended at the terminus of the conveyor, a pneumatic piston kicks it to whichever of the wrappers is ready to receive it. Should both wrapping machines be engaged at the time the coil comes into position, action is delayed until one of the wrappers is free to begin another cycle. Once wrapped, the



Coils are automatically transferred from overhead to roller conveyor as they enter the packing department



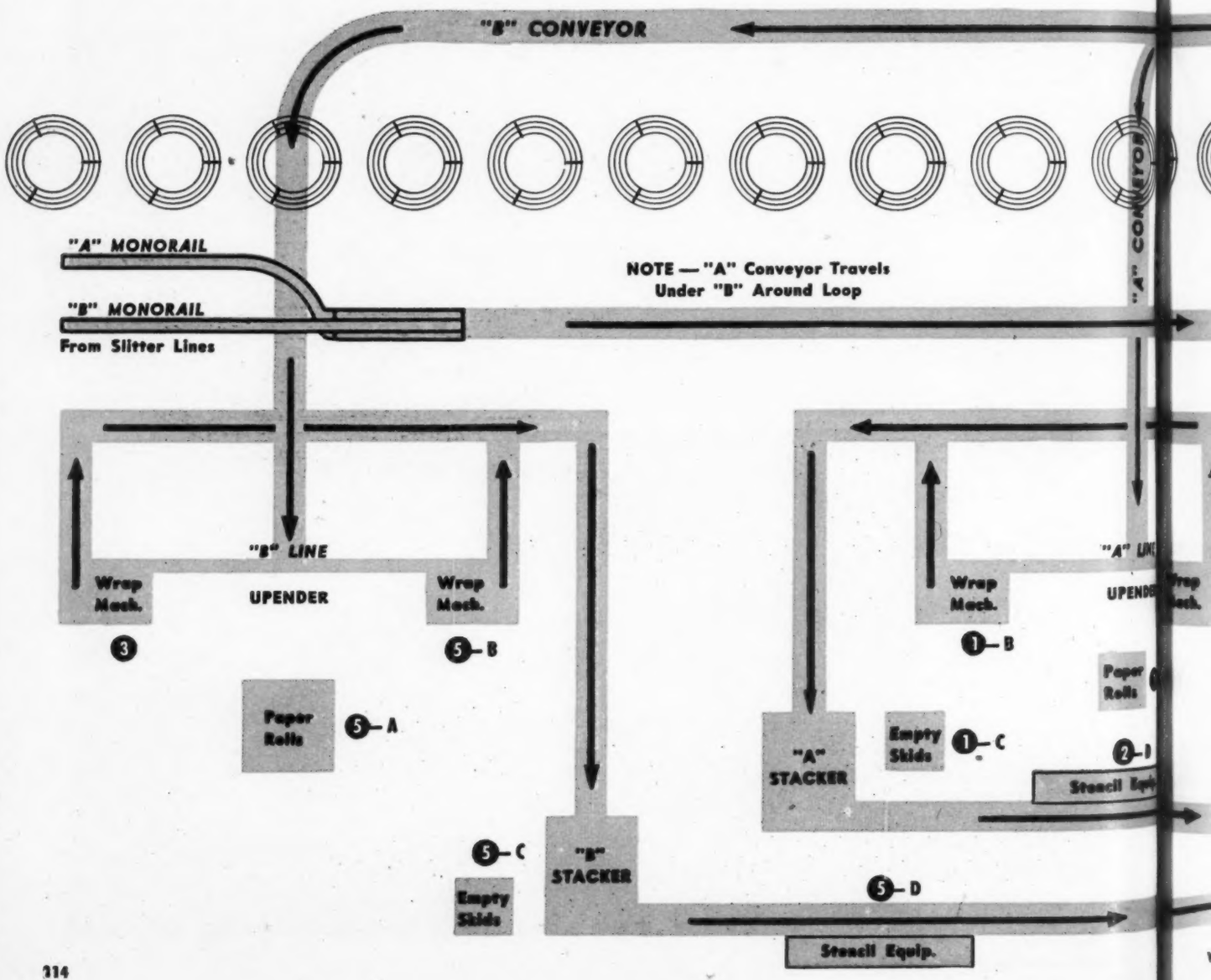
Upender is arranged to send coil to whichever wrapping machine is ready to receive it



Stacking of coils on shipping pallets is completely automatic. Platform tilts when it reaches conveyor level, sends stack on its way down the rollers

JOB DESCRIPTION

"A" PACKING LINE	"B" PACKING LINE
NO. OF OPERATORS — 2	NO. OF OPERATORS — 3
DUTIES OF OPERATOR #1	DUTIES OF OPERATOR #3
A. Prepare & Position Moisture-Proof Paper	Wrap Coils
B. Wrap Coils	DUTIES OF OPERATOR #4
C. Stencil Empty Skids	Compress & Strap Skid
DUTIES OF OPERATOR #2	DUTIES OF OPERATOR #5
D. Empty Skid to Stacker — Stencil Full Skid	A. Prepare & Position Moisture-Proof Paper
E. Compress & Strap Skid	B. Wrap Coils (as required)
F. Weigh, Stencil, & Record	C. Stencil Empty Skids
	D. Empty Skid to Stacker — Stencil Full Skid
	F. Weigh, Stencil, & Record



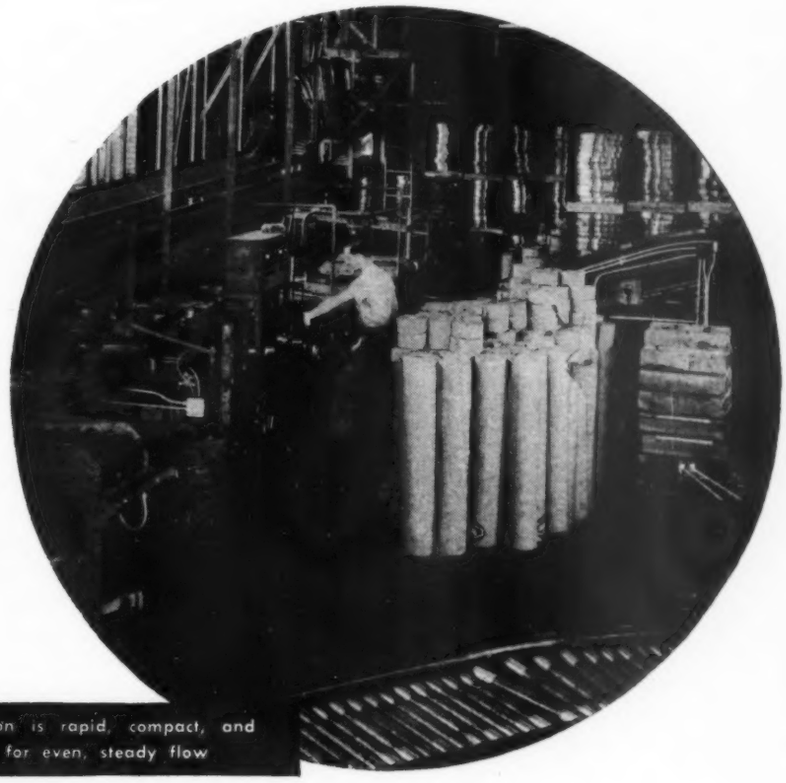
coil is rolled onto an adjacent power roller conveyor, which carries it to the stacker.

Coil moves forward on the tilting, counter-balanced arms of the stacker until it meets a back stop limit switch, which causes the arms to be disengaged—by solenoid action—from a cam-held position. Weight of coil then tilts arms downward and away from coil, so that it is dropped through a distance equal to its own thickness to a skid placed on the platform of the stacker. Platform is a section of roller conveyor, moved up and down by hydraulic pressure. When skid is fully loaded, platform is lowered to level of a gravity roller conveyor; slight tilting action sends the skid on its way to the compression table. From the time the skid is fully loaded until it is replaced by an empty one and the platform returned to position, action of the power roller conveyor feeding new coils to the stacker is automatically halted.

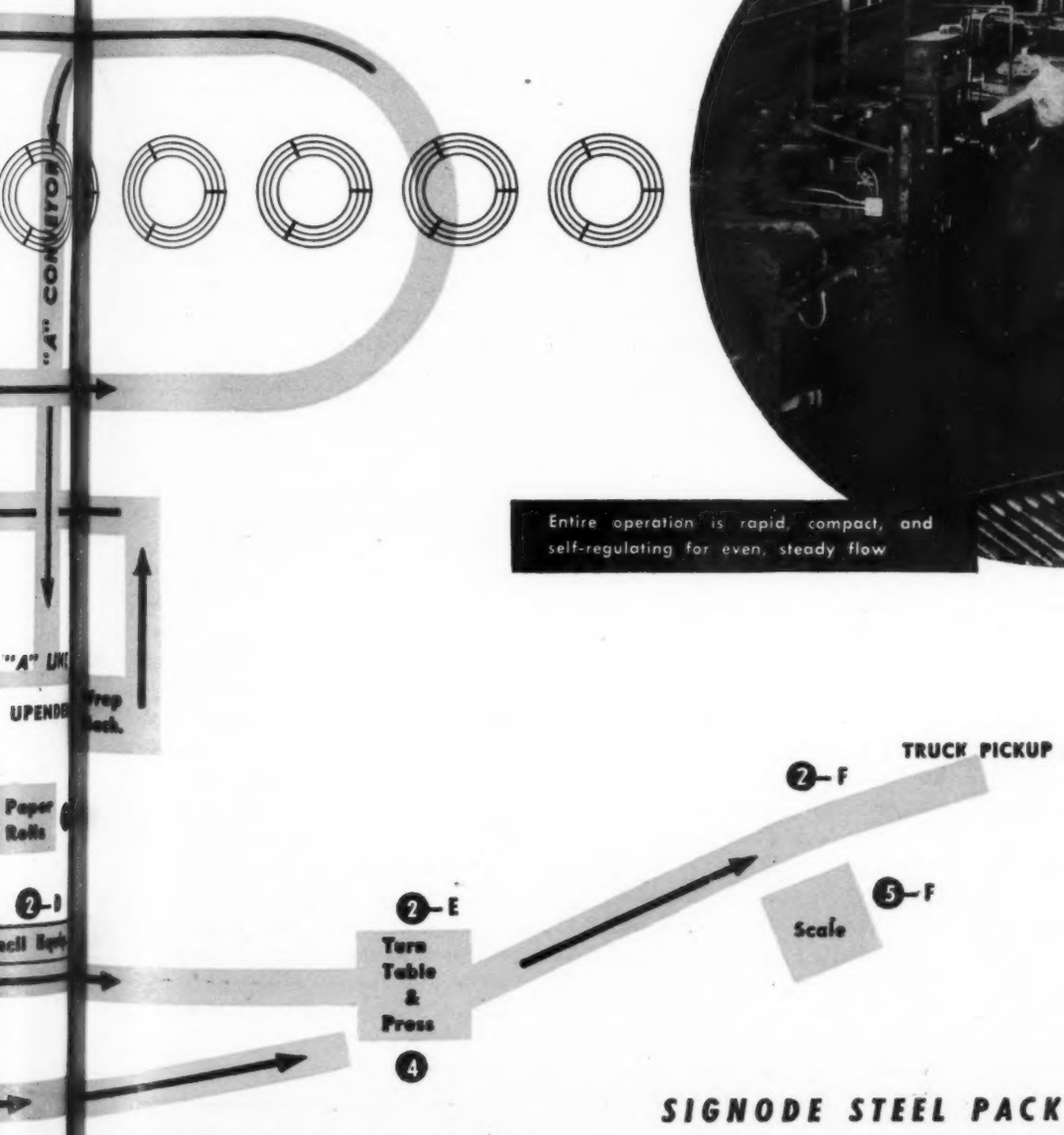
These operations of upending, wrapping, and stacking are performed separately for the coils moving from lines A and B. At the next operation, the lines merge in a combination turntable and hydraulic press.

As skids roll onto the turntable, the coils are compressed under a pressure of 2000 p.s.i., and while under that pressure are strapped to the skids. This completed "package" then rolls down a gravity conveyor to final inspection.

At this point, the coils are inspected, weighed, and tagged with the necessary approval tickets. The weighmaster then releases a stop, and the skid continues to move by gravity to the end of the conveyor, which is right in the shipping area.



Entire operation is rapid, compact, and self-regulating for even, steady flow



SIGNODE STEEL PACKING LINE LAYOUT

HOW INDUSTRY LOOKS AT PORTAL-TO-PORTAL PAY

With the principle of portal-to-portal pay apparently established for all employers by the Supreme Court, a preview of the changes it will bring is provided in this FACTORY survey of top management in manufacturing industries.

The survey reveals:

1. The bigger the plant, in general, the bigger is the problem of portal-to-portal pay, and the bigger the payroll increase will be.

2. One out of two managements expects that changing to the gate-to-gate pay plan would increase employees' compensable time anywhere from 1 to 45 minutes. The largest single group of these expects about a 10-minute increase. Industry is closely studying the latest decisions on the wage-hour law.

3. Changes in buildings, layout, and working routines that reduce travel and nonproductive time have been made in recent years in 29 percent of the companies covered in the survey. Many more will make changes if portal-to-portal pay becomes obligatory.

4. Regardless of the merits of portal-to-portal pay, claims for retroactive payments are not justified, say 93 percent of the executives. Six percent have not yet formed an opinion. Only one percent say "yes"—and they qualify it usually by adding "in some cases."

Portal-to-portal pay has been a fringe issue in collective bargaining. But the current interpretations of the wage-hour law are making travel time a top-drawer problem for top executives and personnel men. Responses to FACTORY'S survey show that the problem is under study in a large portion of industry.

Of the companies surveyed, one in three of the small companies (up to 500 employees) and one in five of the larger companies expect that widening the concept of working time would make little difference in payrolls or operations. Many of the small plants now have time clocks at their plant entrances and have been paying workers for all the time spent on company property.

In larger plants, many managements expect that portal-to-portal payment would add 5 to 10 minutes to the time for which they pay each worker daily. However, comments indicated that many of these plants could reduce travel time by relocating clocks so that no worker has a substantial walk from the clock to his job. Similarly, if preparatory time is now substantial, many of the companies may change working routines to reduce it. The cleaning gang may do more of the preparatory work, or pay plans may be adjusted to allow for such preparatory work as part of the regular working day.

Lacking a full and final decision on portal-to-portal pay and all that it requires, many managements haven't yet decided how they will meet the problem. Thirty-three percent of the executives polled did not answer the question, "What changes in buildings, layout, and working routines would you expect to make if portal-to-portal pay becomes obligatory?"

In refusing to rehear the Mt. Clemens Pottery Company case at the opening of the fall term, the Supreme Court apparently established the wider concept of working time in principle. In the present interpretation, the wage-hour law holds every employer covered by it theoretically responsible for compensation to his employees for time they spend walking to work after punching in at the time clock, and for time spent in preparing to work.

But, if that conception is broadened—by the courts, Congress, or union action—to include time spent walking from the gates—that is, payment for all time employees spend on company property—it will seriously affect all of industry.

For the big plants—automobile, steel, electrical, and others that really cover acreage—compensation for travel time and time spent in preparing for work may increase payrolls by six percent or more. Eighteen percent of the executives in plants with more than 500 employees say that it would mean paying workers for an extra 8 to 12 minutes.

The changes large and small companies have made to reduce walking time and other non-productive time include: centralizing washrooms and locker rooms, locating time clocks and time card racks closer to working stations, consolidating departments, adding entrances and improving parking, and improving plant layout.

If portal-to-portal pay becomes obligatory—and particularly if the concept of working time is broadened to include time spent walking from the gate to the time clock—more companies will make similar changes. Time clocks may then be moved to the plant entrances to get a better check on the time employees spend on company property.

Giving management most concern under the interpretation is not the wider concept of working time, but the retroactive liability. Employees may sue—and several cases have been filed—for travel time going back to June 25, 1938, the date the wage-hour law was enacted.

Congress, in the end, will probably have to amend the wage-hour law to limit claims for back-pay under the Supreme Court's ruling and to clarify the position of companies that have followed the rulings of the wage-hour administrator only to have this upset by the courts.

Certainly management, as 93 percent of the executives indicated in saying that claims for retroactive payments are not justified, wants no part of the headaches involved.

Q If your company should change to a portal-to-portal pay plan, for how many extra minutes, on the average, would you pay each worker per day?

A

None	say	30%	of respondents
Two minutes or less	say	4%	of respondents
3-5 minutes	say	8%	of respondents
5-8 minutes	say	6%	of respondents
8-12 minutes	say	11%	of respondents
12-15 minutes	say	4%	of respondents
15-20 minutes	say	4%	of respondents
More than 20 minutes	say	8%	of respondents
No answer		25%	of respondents

Q About what percentage would it increase your payroll?

A

None	say	29%	of respondents
2% or less	say	21%	of respondents
3-5%	say	7%	of respondents
6-7%	say	4%	of respondents
8-10%	say	5%	of respondents
11% or more	say	1%	of respondents
No answer		33%	of respondents

Q Have you made changes in buildings, layout, and working routines in recent years which were designed to reduce the time workers spend in walking, changing clothes, or preparing to work?

A

Yes	29%
No	55%
No answer	16%

Q If so, what are they?

A

Relocate time clocks, lockers, washrooms	45%
Rearrange plant layout, consolidate departments, change routines	33%
Add entrances, improve parking facilities	20%
Substitute timekeepers for time clocks	2%

Q What changes in buildings, layout, and working routines would you expect to make if portal-to-portal pay becomes obligatory?

A

None	58%
Relocate and add gates and time clocks	4%
Add more time clocks	1%
No answer	33%

Also mentioned were: Move clocks closer to gates, improve parking facilities, eliminate parking on company property, completely redesign layout, transport workers as close to jobs as possible, check time more closely, specify that workers use shortest route in and out of plant.

Q Regardless of the merits of the plan, do you believe claims for retroactive portal-to-portal pay are justified?

A

Yes	1%
No	93%
No answer	6%

Portal-to-Portal Pay Plans Will Affect Big Plants More Than Small

MINUTES PORTAL-TO-PORTAL PAY PLANS WOULD ADD

Minutes	100 employees or less	101-250	251-500	Over 501
None	31%	39%	29%	19%
Two or less	7	6	3	0
3-5	5	6	12	11
5-8	9	4	6	5
8-12	5	10	12	18
12-15	3	0	6	8
15-20	2	2	3	8
More than 20	10	8	6	8
No answer	28	25	23	23

INCREASE IN PAYROLLS

None	33%	36%	24%	23%
2% or less	21	18	18	26
3-5%	5	2	18	8
6-7%	5	4	4	3
8-10%	5	0	0	10
Over 10%	0	2	0	2
No answer	31	38	36	28

700 ORDERS KEPT ON THE BEAM BY VISUAL SCHEDULES

J. T. PURTELL • SERVICE MANAGER, ALLEGHENY LUDLUM STEEL CORPORATION WATERVLIET, N. Y.

Control room clerks post changes in the status of work in process. Space for 700 orders is provided

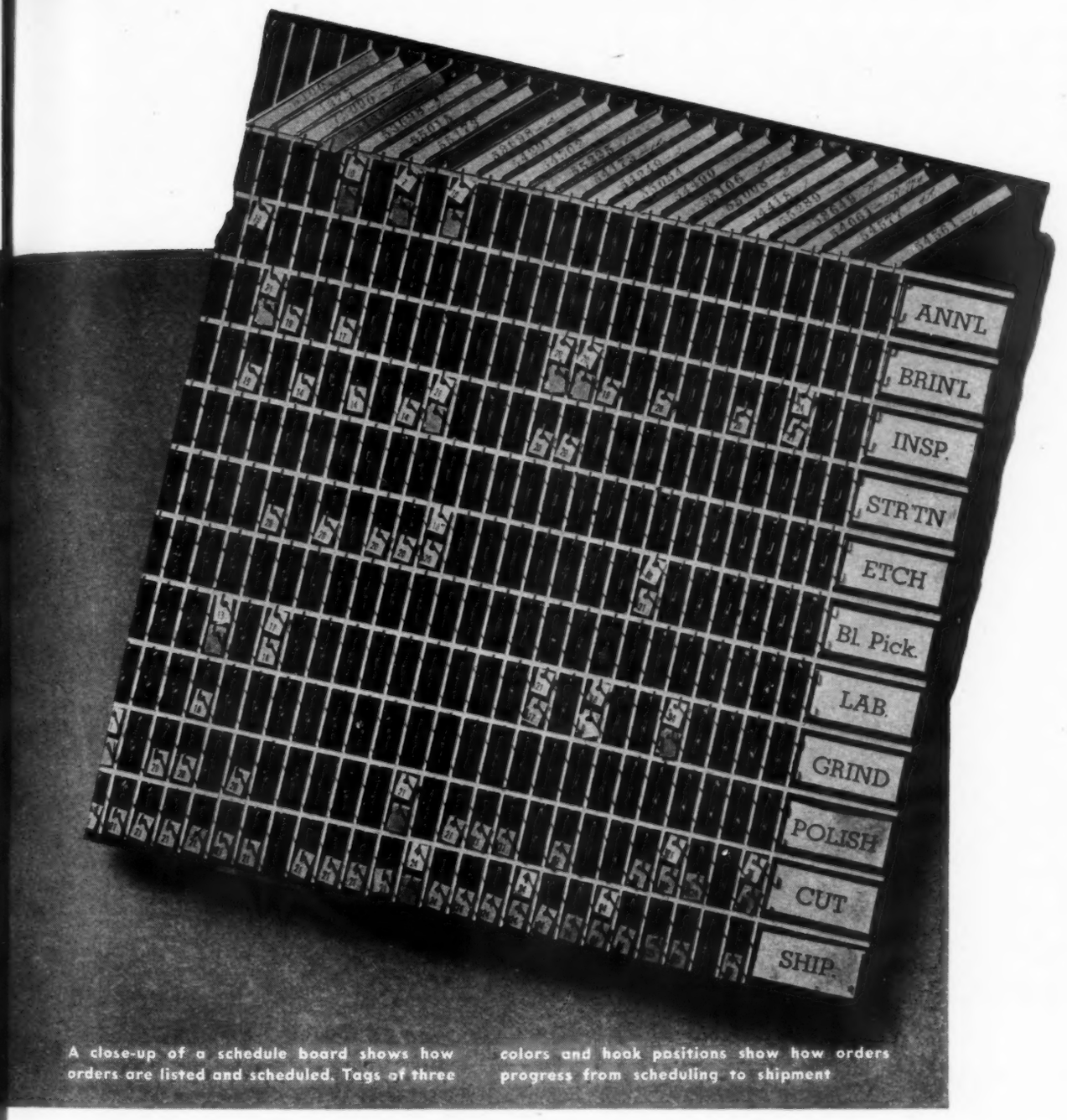
A far better picture of finishing-operations progress. Fast alerts for delays to individual orders. That's the one-two punch provided by wall-mounted production scheduling boards, recently installed in the Watervliet plant of Allegheny Ludlum Steel Corporation. These boards occupy a 28-ft. wall section, 52 inches wide, in a control room that is separated by a glass partition from a central hall where foremen, supervisors, and all concerned with expediting orders through the mill may readily see the status of operations or orders.

Space for 700 orders is provided by 28 scheduling boards. The boards are 24x26 inches and have white lines on a black background. Each board has 25 vertical columns ¾ inch wide and an operations column 5 inches wide. Horizontal lines are 2 inches apart, making space for 11 operations, with 3½ inches remaining at the top for slanting metal slides that accommodate order number strips of heavy paper. Each rectangle formed by vertical and horizontal lines has an upper and lower hook for hanging colored and numbered tags.

The operation of these boards follows work orders received from the mill. When first received these orders give the required processing of a material, the scheduled date for completion of each operation, and the date for scheduled shipment. Control room clerks attend to the following operations:

1. A heading slip with the order number is placed over an empty column in chronological order of shipping dates.

2. Green tags bearing numerals that indicate operation completion dates are hung on the lower hooks within rectangles corresponding to the scheduled operations.



A close-up of a schedule board shows how orders are listed and scheduled. Tags of three colors and hook positions show how orders progress from scheduling to shipment

3. When the work goes to the first operation, a white tag with a number that shows the starting date is hung on the upper hook in the corresponding rectangle.

4. As soon as the first operation is completed, the work sheet is returned to the control room for posting. Both green and white tags are removed from the first operation rectangle, and another white tag with the proper date is hung on the top hook in the rectangle corresponding to the next operation to which the order is assigned. In this manner, only operations to be performed are represented by tags on the board—a green tag without a white tag indicating work to be done but not yet in process, and a white tag on the upper hook indicating the operation at which the work is located and in process.

5. Each day the boards are studied and if, for instance, on the fourth of the month a delayed order is indicated by a white tag above a green tag with a "3" on it, a red tag is hung over the green tag.

6. If delays in previous operations cause an order to be assigned to an operation later than the scheduled date on the green tag, a red tag is hung over the green tag at the time of assignment.

7. Particular attention is given to red tag orders by an expediter. It is his duty to keep orders moving.

8. Boards are shifted to the right and condensed as they are cleared by shipments of orders. This is simplified by using rails for hangers, making removal and rehanging of boards easy.

Red tags spot either isolated delays, or in the event of a "jam" in any operation, a series of red tags is evidence of this condition.

SOME OF THE NEWER JOBS PHOTOTUBES ARE DOING

F. P. DUNIGAN • CONTROL DIVISION, GENERAL ELECTRIC COMPANY, SCHENECTADY

1 ***Measuring Length.*** The pug mill shown extrudes a clay tube that is so soft that the shearing knife is a taut wire. The clay tube could be cut to length if a limit switch were mounted the proper distance from the extruder. However, a mechanical limit switch would not only mark the soft clay but would become gummed up in a short time. As shown, a photoelectric relay solves this problem satisfactorily.

The relay controls a solenoid valve that admits air to the cylinder that drives the knife.

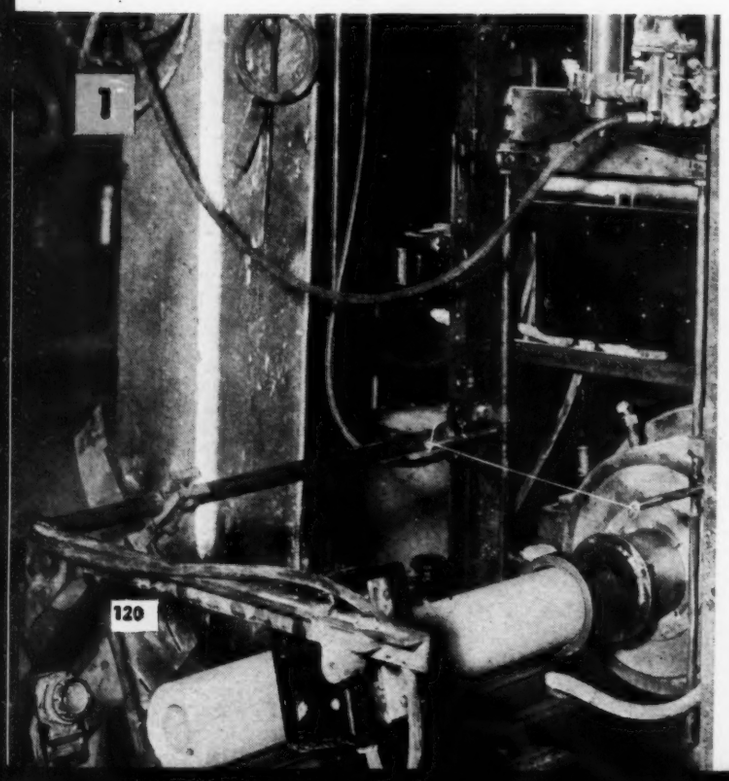
2 ***Control of Resistance Welding Machines.*** In the fabrication of large flat metal panels, a resistance welding machine having a movable work table commonly is employed. Operation consists of stopping the moving bed at predetermined intervals, lowering the welding electrodes, making the weld, raising the electrodes, and moving the bed to the next position. Since large machines of this type are called upon to weld a variety of patterns, a simple form of limit switch is highly desirable. Photoelectric relays are used for this purpose, with very satisfactory results.

A strip of metal with evenly spaced holes is attached to the moving bed. The holes normally are plugged with rivets of suitable size. The phototube holders and light sources are mounted in such manner that light will fall on the phototube whenever one of the rivets is removed. By using two "tracks" and four photoelectric relays, it is possible to control the welding machine merely by removing the rivets corresponding to the desired welding pattern. Changing the location of the welds thus becomes a simple matter.

A similar scheme has been used in the resistance welding of steel gratings.

3 ***Holding a Slack Loop.*** When handling a continuous web, as in steel and paper mills, it is often necessary to synchronize a pay-off reel with the processing machine. In other instances a slack loop must be maintained to permit lateral shifting of the web. In these applications it is essential that the web should not be allowed to become taut or to touch the floor. If either of these conditions is permitted, the web may break or become snarled up in the machine.

Standard photoelectric equipment can be used to maintain such a loop. A sheet of light is directed to a bank of phototubes in such manner that the beam is partially intercepted by



the loop. If the loop tends to deepen, less light reaches the phototubes, and *vice versa*.

The output of the phototubes is amplified and used to supply excitation to the field of the d. c. reel motor. The motor field excitation is therefore continuously regulated to maintain the proper depth of loop.

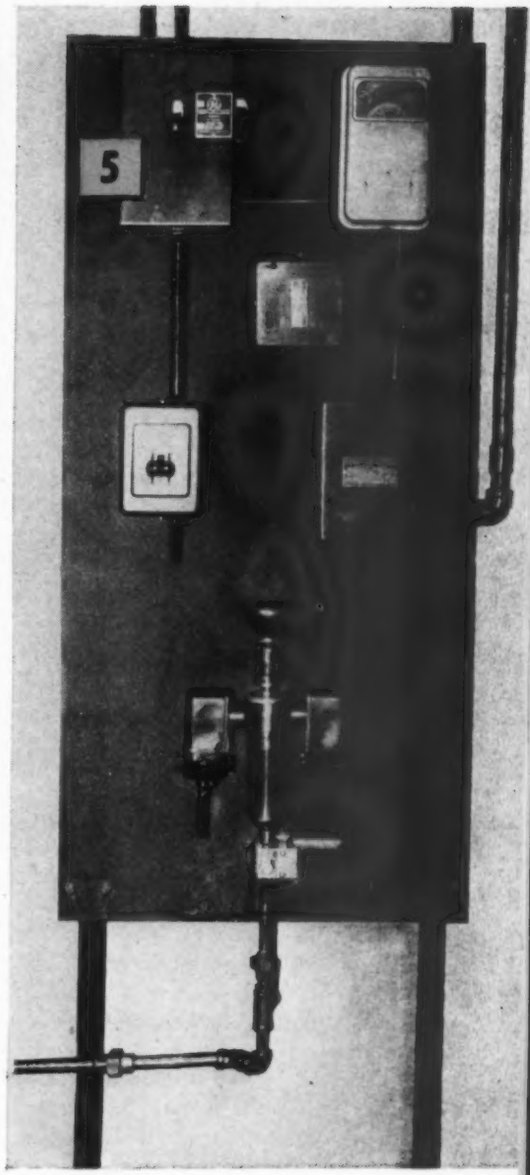
4 ***Detecting Pinholes.*** When metals are rolled into very thin sheets, such as those used in making food and beverage containers, the presence of pinholes is highly undesirable. This mill is equipped with a photoelectric pinhole detector that spots holes having a diameter greater than 0.015 inch at web speeds up to 1000 f.p.m. More sensitive equipments can detect holes as small as 0.005 inch.

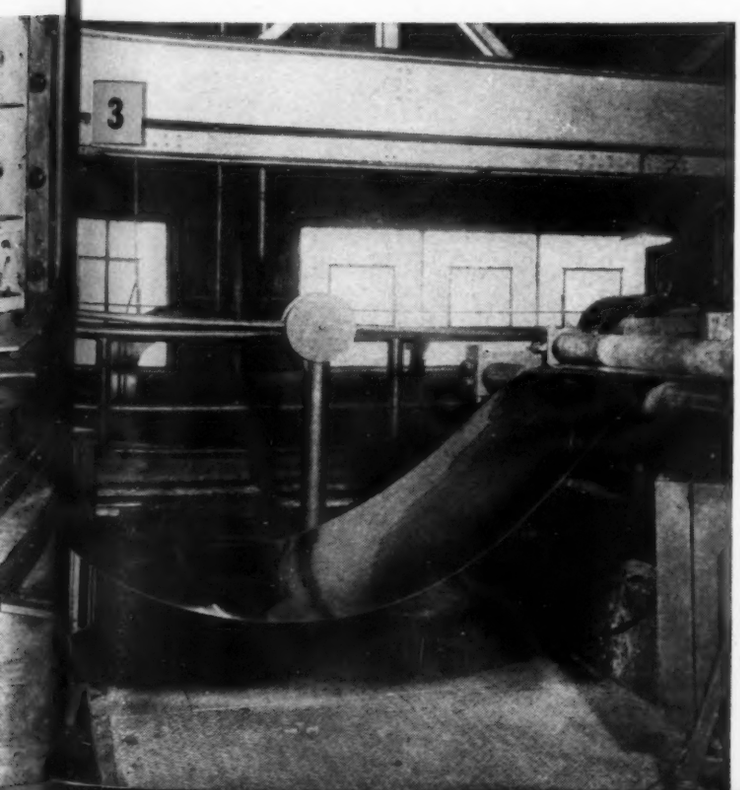
5 ***Automatic Control of Viscosity.*** In many enameling processes, the material is constantly recirculated from the applicator to the storage tank and back, to prevent drying in the applicator. Unless additional solvent is added from time to time, however, the enamel will become more and more viscous. This is especially true with some of the extremely volatile solvents which are now in use.

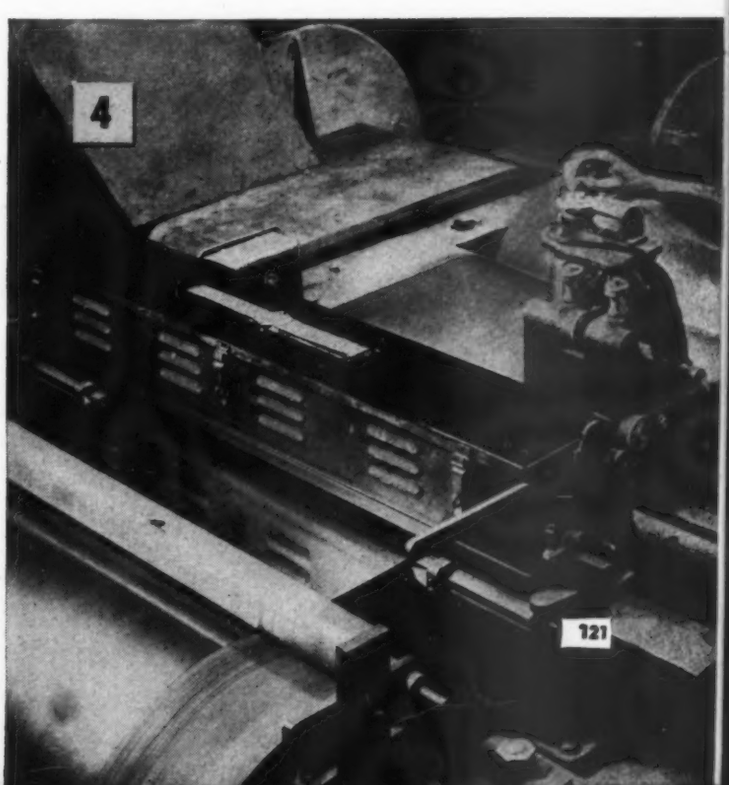
In one application, this problem was solved by the simple expedient of diverting a small portion of the solvent into a measuring cup that has an orifice in the bottom. Excess enamel spills over the rim of the cup and is collected by an overflow system. The bulk of the sample passes through the orifice to a measuring chamber equipped with a solenoid valve, and thence back to the system proper.

A time switch automatically starts the test cycle every 15 minutes. First, the solenoid valve on the measuring chamber is closed, and at the same time a second timer is started. When the solenoid valve closes, the measuring chamber starts to fill. In 1½ minutes the chamber should be filled. Either the liquid itself or a float in the chamber interrupts the light beam when the chamber is filled, causing a photoelectric relay to operate. The second timer is designed to "time out" in 1½ minutes. Obviously, there is a race between the second timing relay and the operation of the photoelectric relay.

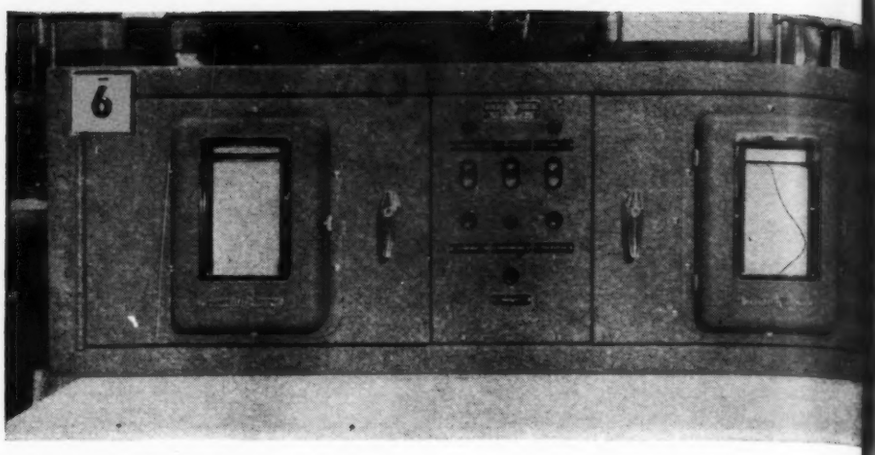
If the viscosity of the enamel is too high, the photoelectric relay operates before the timer, causing a valve to open and admit a certain amount of solvent to the system. The time switch then empties the test equipment and 15 minutes later rechecks the viscosity. This procedure goes on continuously, solvent being added or not as required.







The desired viscosity determines the size of the orifice and the timing elements.

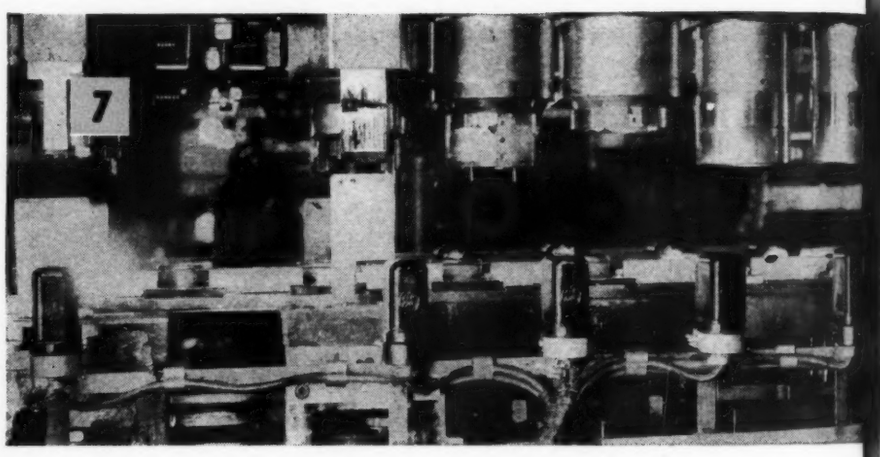


6 ***Process Control.*** Special photoelectric equipment takes plotted data from a moving paper strip, such as shown on the right-hand instrument, and converts this information into an electrical signal. This signal can then be used to control motor speeds, valve positions, or perform other functions.

7 ***Protecting Automatic Presses.*** The dies used in multiple-die, automatically-fed forming presses are expensive, but if one workpiece does not move to the next station before the following operation, the dies may be severely damaged. It is a fairly simple matter, however, to prevent such damage.

Here such a press is equipped with simple photoelectric relays. One is mounted on the side of each die. These relays are normally made inoperative by cam-actuated contacts. When the conveyor moves the parts from one station to the next, the phototubes are allowed to "look" at the conveyor. If any of the workpieces are not moving from one station to the next, one of the light beams reaches the phototube which, in turn, shuts down the press and actuates an alarm.

Prevention of one improper operation will often pay for the complete photoelectric equipment.



8 ***Air Doffer.*** When they come from an automatic ironer, articles made of cloth may be too hot to handle, but they have to be stacked. On the other hand, it may be undesirable to touch the parts lest they be soiled or torn. Such parts can be handled by a controlled air stream. Photoelectric equipment controls a solenoid valve to turn controls on at just the proper time.

WHAT THE PRODUCTIVITY CONFERENCE DID

Top executives in industry can profit from studying results of the Washington Conference on Productivity because:

1. Many of the problems and the conflicts in viewpoint will appear as management studies productivity in their own plants

2. From the teamwork of the industrial, labor, research, and government representatives now tackling the highly technical problems may come a new yardstick of productivity which will be a basic tool in collective bargaining

Although Solomon Fabricant was only one of many experts attending the Washington Conference on Productivity, his leadership was attested to by his selection to head the committee appointed to steer continuing study. Fabricant, a member of the staff of the National Bureau of Economic Research, has published books on his studies of the development of manufacturing in the United States

Although the Conference on Productivity held in Washington late in October seems chiefly a springboard from which the topflight economist attending will take off for more study, it revealed much that is important to industry.

The conference—with former New Deal chieftains stating the principles—emphasized the need constantly to raise productivity.

It underlined the increasingly important role that measurements of productivity are expected to play in collective bargaining.

The conference, sponsored by the Bureau of Labor Statistics and the Budget Bureau's Statistical Standards Division and planned by representatives of government, the CIO and AFL, and Swift & Company and Westinghouse, made little progress toward its fundamental job. *It never did evolve a satisfactory definition of the concept of worker productivity.*

But the disagreements shown in discussing the problem will be met by every management that attempts studies on its own. That they were brought into the open is a net gain.

Management, for its part, made clear that it was interested in productivity measurements in order to have a talking point in meeting across the bargaining table.

Union representatives, with the bargaining table also in the backs of their minds, insisted on getting their reservations as to the reliability of present productivity indexes into the record.

The CIO, represented by Katherine Ellickson, assistant director of research, made these points, among others, in indicating the limitations on the BLS measures of productivity and labor costs:

1. Production patterns have been greatly changed by the war, and the

BLS figures do not allow for the changes.

2. BLS employment and man-hours data are inflated by including time paid for, but not worked, such as vacations, holidays, call-in time, and sickness benefits.

3. Output per man-hour is too narrow a concept of productivity. Economies in production brought about by better integration, improved materials, and more economical use of fuel and power are not taken into account.

4. Labor regards suspiciously the possibility of employer influence in reporting the figures on which BLS studies are based.

Labor representatives raised the point, and BLS officials agreed, that broad indexes of man-hour output or unit labor costs should not be used in collective bargaining because they reflect the efficiency of all elements that go into production, rather than the efficiency of the worker alone.

If productivity indexes are to be used in collective bargaining, too, they must be set up to determine the contribution made by different factors that go into producing a product, and they must indicate how to apportion the benefits from increases in productivity.

Union spokesmen insisted on labor's right to share the benefits of any gain in productivity and, in developing their point, asked why management productivity, the efficiency of management, is not measured.

Management, in turn, asked whether efficient management engineering should be reflected in the incentive wage structure.

METHODS CRITICIZED

Both sides criticized the present methods of reporting on productivity because:

1. There is no agreement on the meaning of the term productivity—especially with respect to labor's contribution.

2. Productivity figures are highly technical instruments, and even the specialists have difficulty in using them.

3. Present methods of figuring were not designed to be used in some of the places where there has been much call for them lately—such as on collective bargaining tables.

BLS now publishes indexes on productivity and unit labor costs in 32 non-munitions manufacturing industries, six mining industries, steam railroad transportation and electric power and light, and in agriculture, although in the last group determination is made of "output per worker" rather than unit labor costs.

In the face of the criticism, BLS officials said that methods of reporting on productivity were constantly being improved. And the farther the country gets away from war, the more the indexes will improve. Furthermore, the time has now come when indexes should be refined so they will be helpful in collective bargaining.

Despite its disagreements, the conference established a wide area of agreement. In summarizing the work of the conference, Samuel H. Thompson of the Department of Commerce gave thirteen points on which conferees fully agreed. Chief among them:

1. The country needs standards of measurement that will help to increase productivity.

2. More kinds of measurement are needed in addition to the concept of productivity in terms of man-hours.

3. Clarification of the standards and what they can be used for, is essential.

4. More industrial firms must keep systematic records on which indexes can be based.

5. Many factors contribute to productivity. Responsibility for gains, or blame for declines, cannot be assigned any one group. Similarly, the rewards must be distributed as fairly as possible.

Having stated its accomplishments, the conference decided that its work must be a continuing study. A permanent committee to decide how the work would go on was set up with Solomon Fabricant of the National Bureau of Economic Research as its chairman.

Also, the Bureau of Labor Statistics is going to re-examine its indexes, perhaps discard some, modify others, and extend its studies into industries not now covered after discussions with management and unions in those industries as to the material to be used. BLS will also issue descriptions of the statistical methods used in construction of the productivity indexes and will invite criticism of them. This will clarify one of labor's principal arguments against use of the indexes. Union researchers complain that there are no limitations on the use of present indexes because the department does not state how they are made up and the uses for which they are intended.

High spot of the meeting—to many of the observers from industry—came when a fundamental change in viewpoint toward productivity was stated. Even such New Dealers concurred as Leon Henderson, first head of OPA and now chief economist of the Research Institute of America, and Robert R. Nathan, formerly of the War Production Board. That change emphasized that the "technological unemployment" fear of the 1930's was negative.

POSITIVE APPROACH

The new, the positive, approach is that increasing productivity means more production, a higher living standard, with the same number of workers. Increasing productivity is a means of raising living standards and maintaining employment, rather than simply holding even on production and a standard of living while allowing employment to dwindle.

Henderson and Nathan, who server as chairmen of the two sessions during the first day of the conference, both pointed out that clarifying the definition and measurement of productivity would be important domestically and throughout the world in maintaining full production and full employment.

Nathan summed it all up in saying: "It is defeatist to say that full employment and productivity are inconsistent with each other."

GANG PROCESS CHARTS IN WORK SIMPLIFICATION

JOHN V. VALENTEEN • STAFF INDUSTRIAL ENGINEER, ARMSTRONG CORK COMPANY, LANCASTER, PA.

Recent addition to the list of so-called management tools at Armstrong Cork Company is the gang process chart. As a supplement to the man-and-machine utilization chart—or, in some cases, as a substitute—it simplifies the engineer's job of "selling" improvements to management.

Gang process charts are used to balance the work in operations involving crews of 2 to 20 men. They are used as a presentation to top management to give a quick over-all perspective of problems involving the cycle of work for each man of a crew with respect to the work done by the other members of the crew. They indicate the part of the cycle that is spent in productive work, and the part that is consumed by delays or idleness. They permit relatively long cycles of work involving a large number of small elements to be handled in a convenient, easy manner without the need for detailed time values. Because of these features, they are ideally suited for use by foremen and general supervision, as well as by methods engineers.

Basically, the gang process chart consists of an *individual* process chart for each member of a gang. The chart symbols for the actions of each member are arranged in such a way that those appearing on one horizontal line represent action performed simultaneously by each gang member.

The effect of the completed chart is to show the particular operation as if a series of photographs had been taken at regular intervals. These intervals are determined on the basis of a change in activity of any member of the gang, except where the change is of short duration, or unusual in the normal cycle.

Descriptions of the various activities are not entered beside the symbol, as in the process chart, but are coded and listed on the side of the chart. This permits the individual symbols to be placed side by side, thereby facilitating visual analysis. The chart is usually constructed to show one complete representative cycle.

For anyone accustomed to making process charts, there is nothing new to learn to be able to prepare a gang process chart. All that is needed is a little extra care in balancing the movements of each member of the crew when the duties of any one member are changed.

A question could be raised as to the value of the gang process chart as compared to the activity chart, sometimes referred to as a man-and-machine or man-and-equipment utilization chart. It could be argued that the former does not give as much information as the latter. This is essentially true.

However, gang process charting has several advantages which do not exist in the man-and-machine chart:

1. *Preliminary* investigations of problems involving large crews can be made rapidly and cheaply with gang process charts because actual time values are not required. This permits a wide usage of the charts by all management personnel, and not just by industrial engineers.

2. If the development of a gang process chart indicates the need for additional information, such as the complete detail of all work elements with values, the over-all cycle time, or the relation of time worked to total cycle time, a man-and-machine chart can be prepared to show these data. The use of the gang process chart in conjunction with a man-and-machine chart is, then, a highly

TRAINING NON-ENGINEERS TO USE GANG PROCESS CHARTS

WHY? By virtue of their practical knowledge and familiarity with production operations, foremen and supervisors are in a better position to select cost reduction items and to make use of process charting than are engineers.

HOW? Use visual aids in the form of slides and films to illustrate the principles involved in gang process charting. The actual detail work can be performed by the non-technical man and an engineer, and they can work out the analysis and conclusions jointly.

Armstrong has found short motion pictures of operations in the plant — operations with which all participants are familiar — to be the most helpful in this work.

RESULT: A film of this type was developed at a cost of about $500. The first showing to a group of foremen created so much interest that the suggestions for improvement which followed resulted in changes worth approximately $8000 a year.

Gang process charts make full use of the symbols used in time study and motion analysis. Activity of crew members can be checked by referring to the coded list of job descriptions below. Time values are unnecessary for these charts; otherwise, each vertical column gives complete analysis of the duties of each member of the gang

OLD METHOD

ARMSTRONG CORK COMPANY
GANG PROCESS CHART

OPERATION Grinding — OPERATION NO. 09
SUBJECT Grinding Bales of Cork — PART NO.
DATE 2-7-46
DEPARTMENT Grinder — LOCATION — PRESENT ☐ PROPOSED ☐
PLANT Camden — CHARTED BY — SHEET — OF

NO. IN GROUP 4

Feeder	Opener	Trucker	Wire & Wood Man		NO.	STEPS DESCRIPTION
1	1	2	▽		1	Open Bale—Cut Wire
3	3	2	▽		2	To Cork Storage with Empty Truck
4	5	▽	▽		3	Pull Wire & Wood from Bale
7	8	▽	10		4	Knock Wire Against Wall
11	▽	6	13		5	Remove Wood and Aside
14	14	6	▽	First Bale	6	Load Truck—2 Bales
1	1	9	▽		7	Split Bale with Axe
3	3	9	▽		8	Position Next Bale
4	5	12	▽		9	To Breaker—2 Bales—Hand Trucks
7	8	12	10		10	Place Wire in Press
11	▽	▽	13		11	Position Bale
14	14	▽	▽	Second Bale	12	Unload Bales at Breaker
					13	Collect Wood
					14	To opening position

* NOTE: Two bales are necessary to constitute a complete cycle because trucker handles 2 bales simultaneously while the other members handle them individually.

REMARKS

Production: approximately 50 bales per hour.

SUMMARY

Operations	24
Trans.	10
Delays	14

desirable means of attracting the interest of top management to certain problems.

3. Factory superintendents, plant managers, and production executives do not always have time to examine all problems in complete detail, even though they are vitally interested in cause, effect, and solution. The abbreviation of detail in the gang process chart makes it a valuable selling medium.

4. The gang process chart brings out many otherwise unnoticed facts. The analysis technique developed by preparing this chart has been found to result not only in the improvement of operational methods, but also in the development of foremen who are more interested in doing a better job because they are better equipped to understand management techniques.

The simplicity and usefulness of the gang process chart may be seen in the case history on these pages.

CASE HISTORY

The charts shown are for the operation of a crew feeding cork into a cork breaker. Bales of cork, weighing from 100 to 300 pounds, are taken from a storage pile and transported by hand truck to the breaker operation. The bales are opened by cutting the banding wire with shears; the wood staves and banding wire are laid aside. The bales, while still in a compressed form, are rolled onto a short conveyor, broken open, and spread out along the conveyor. The conveyor carries the cork to the breaker, where it is broken into pieces about the size of a marble and blown by fans into a collector.

The crew on the main breaker consisted of a trucker, a feeder, an opener, and one man to dispose of wire and wood. Increased production requirements had made it impossible for this breaker to handle the full load, so an auxiliary breaker with a 3-man crew was pressed into operation. Besides an uneconomical use of man-power, the simultaneous use of the two breakers often resulted in choke ups at the fans blowing the cork to the collectors. This made it necessary to shut down both breakers while the "jam" was being cleared.

As soon as this condition was reported, the supervisor of the operation and a methods engineer set about finding a solution with the aid of gang process charts.

On analysis, the duties of each member of the four-man crew were found to be:

Trucker—Transfer bales of cork from storage area to the breaker.

Opener—Open bales, remove wire and wood.

Feeder—Feed cork into breaker and assist opener.

Wire-and-wood man—Collect wire and wood; place them in baler.

These duties were then charted as indicated. Reading horizontally, the chart shows the relationship of the duties of any one man to the duties of the other members of the crew at any particular point in the cycle. Reading vertically, the chart indicates the relationship of each major work element to the total work elements required in the complete cycle.

The chart showed the bottleneck to be the opening of the bales. It also showed the trucker to be idle four steps out of the cycle, the opener two steps, the wire-and-wood man eight steps, while the feeder was busy throughout.

Several possible solutions were worked out by the foreman and the engineer, and charts were made for each. The first proposal was to balance the work of the existing four-man crew. The second was to use a three-man crew, and the third was to use a five-man crew.

Each proposed method was checked by making a test run for approximately a half hour. As had been previously indicated by the charts, proposal No. 3 gave every indication of meeting the objectives and solving the problems of capacity, downtime, cost reduction, and job improvement.

The gang process chart of this improved method for the five-man crew presented the facts so clearly that factory management was able to make a decision without the necessity for developing a man-and-equipment utilization chart.

(End)

Except where the change is of short duration or unusual in the normal cycle, a new horizontal row of symbols is entered each time any member of the crew changes his duties. Symbols for other members are changed or repeated as necessary. Armstrong has successfully analyzed the activities of crews of from 2 to 20 men with charts of this type

NEW METHOD

ARMSTRONG CORK COMPANY
GANG PROCESS CHART

OPERATION: Final Improvement – Proposal #3 — OPERATION NO.: 09
SUBJECT: Grinding Bales of Cork — PART NO.:
DATE: 2-7-46
DEPARTMENT: Grinder — LOCATION: — PRESENT ☐ PROPOSED ☐
PLANT: Camden — CHARTED BY: — SHEET: — OF:

Feeder	Opener #1	Opener #2	Trucker	Wire & Wood Man	
1	2	2	3	▽	
▽	4	4	3	▽	
5	6	6	8	7	
9	10	10	8	7	First Bale
1	2	2	11	12	
▽	4	4	11	13	
5	6	6	14	▽	
9	10	10	8.	▽	Second Bale

NO. IN GROUP 5

STEPS

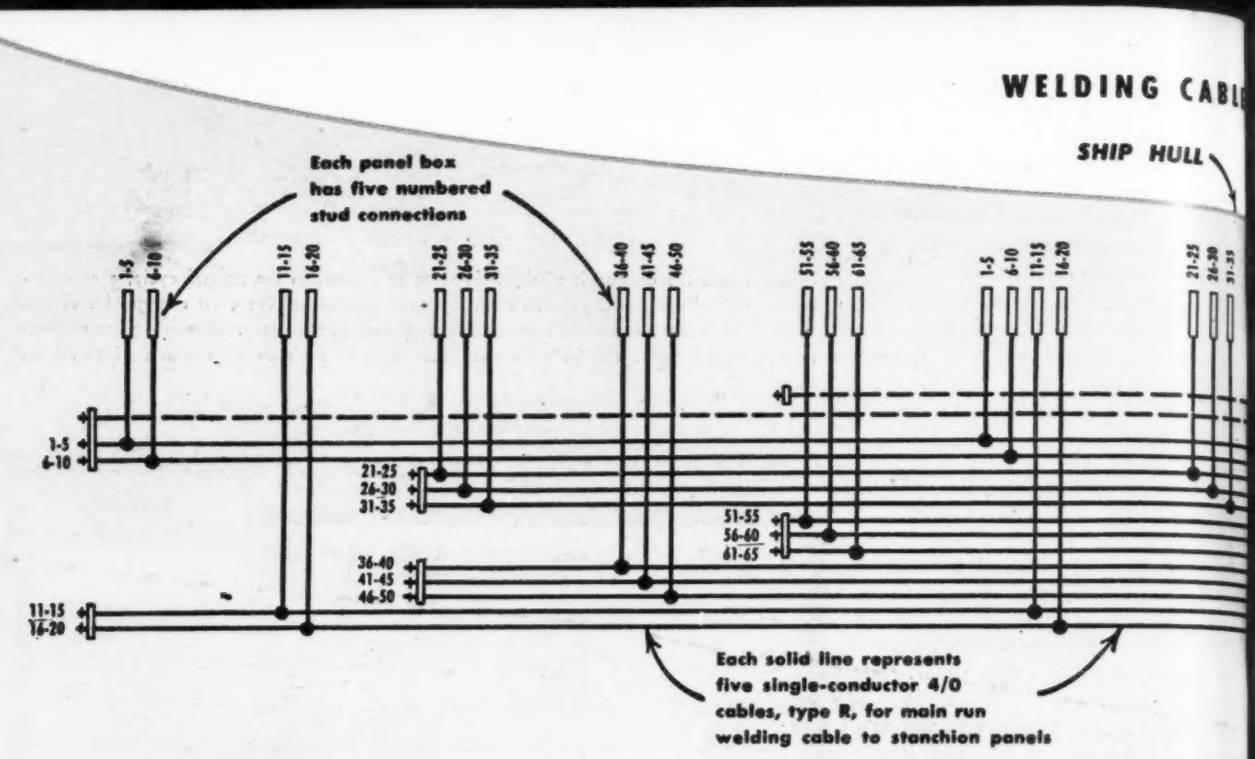
NO.	DESCRIPTION
1	Feed Cork into Breaker
2	Open Bale – Cut Wire
3	To Cork Storage with Empty Truck
4	Remove Top Wood – Roll Bale Over – Throw Wire Aside
5	Remove Bottom Wood
6	Push or Roll Bale on Conveyor
7	Bend Wire – Collect Wood Staves
8	Load Hand Truck
9	Break Bale Apart
10	Position Next Bale
11	To Breaker with Hand Truck – 2 Bales
12	Dispose of Wire
13	Dispose of Wood
14	Unload Hand Truck

REMARKS

Production now averages over 70 bales per hour.

SUMMARY

Operations	24
Trans.	10
Delays	6



MULTIPLE BUS FOR EASY WELDING

GEORGE NICHOLSON • ASSISTANT SUPERINTENDENT OF MAINTENANCE
CRAMP SHIPBUILDING COMPANY, PHILADELPHIA

Nothing moves from point to point when a welder finishes one job and moves to another except the welder himself and a relatively short length of welding cable—with the panel system developed by Cramp Shipbuilding Company to provide fixed taps at multiple locations from end to end of the shipway. A similar arrangement of cables and panels could be adapted to any shop operation where welding operations have to be shifted frequently to several floor areas.

System is based on use of centrally located constant-potential generators of capacity sufficient to supply maximum number of simultaneous welders. At Cramp, two motor-generator sets, rated at 1500 amperes each, located beneath the craneway about midway fore and aft of the hull, have a capacity sufficient for about 50 welders averaging 200 amperes each, with a 30 percent use factor. Directly above the motor-generator sets, on a wooden platform in otherwise waste space, are 80 resistor boxes, each numbered and connected to a corresponding welding bus running alongside and lengthwise of the shipway.

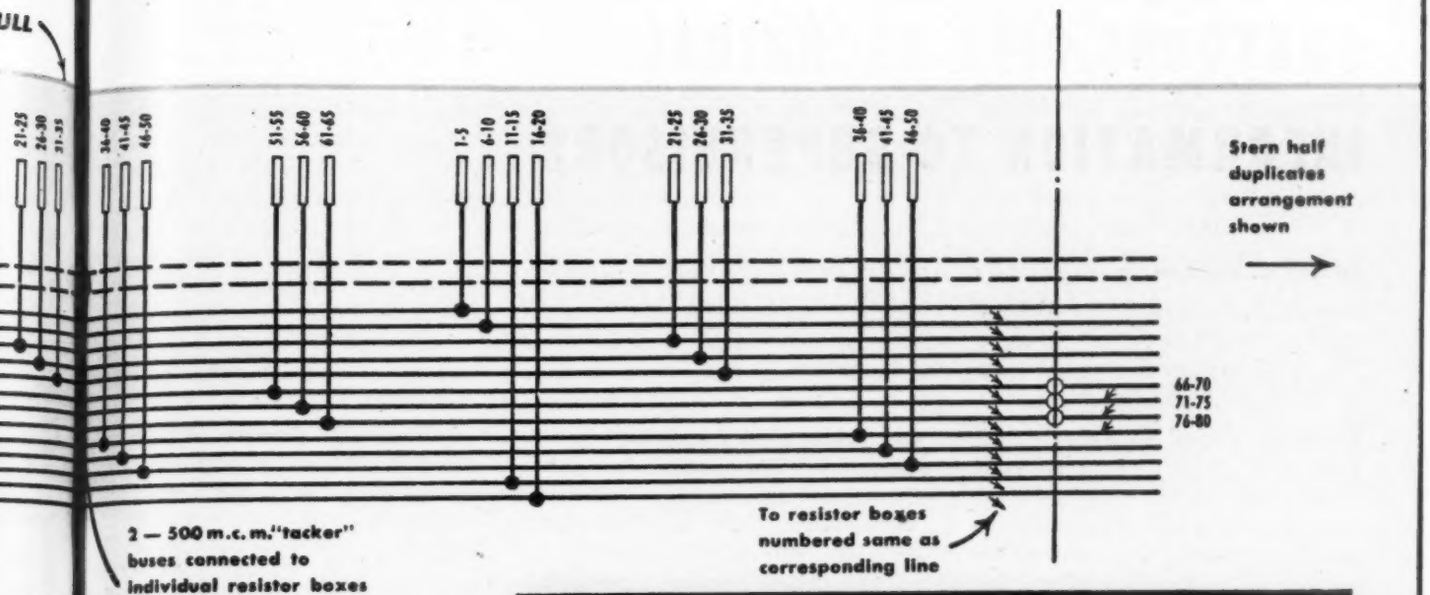
Type R conductors, 65 of them, lead fore and aft from the resistor platform. Strain insulators split 15 of these at the center point to provide the 80 circuits.

Opposite each panel point, corresponding to craneway columns, from 10 to 20 vertical leads of welding cable, in groups of five, are brought down to five-stud enclosed panel boxes clamped to the staging stanchions at any elevation needed to suit the upward progress of the hull. Leads are of sufficient length to reach any point of the stanchions adjacent to actual hull construction.

In addition to the 80 individual circuits for continuous welding, two 500,000 cir. mil single-conductor type R cables, one running full length and the other part way, are tapped by 4/0 welding cables at each craneway column for tacking. In this manner tacking operations do not tie up any of the principal welding circuits.

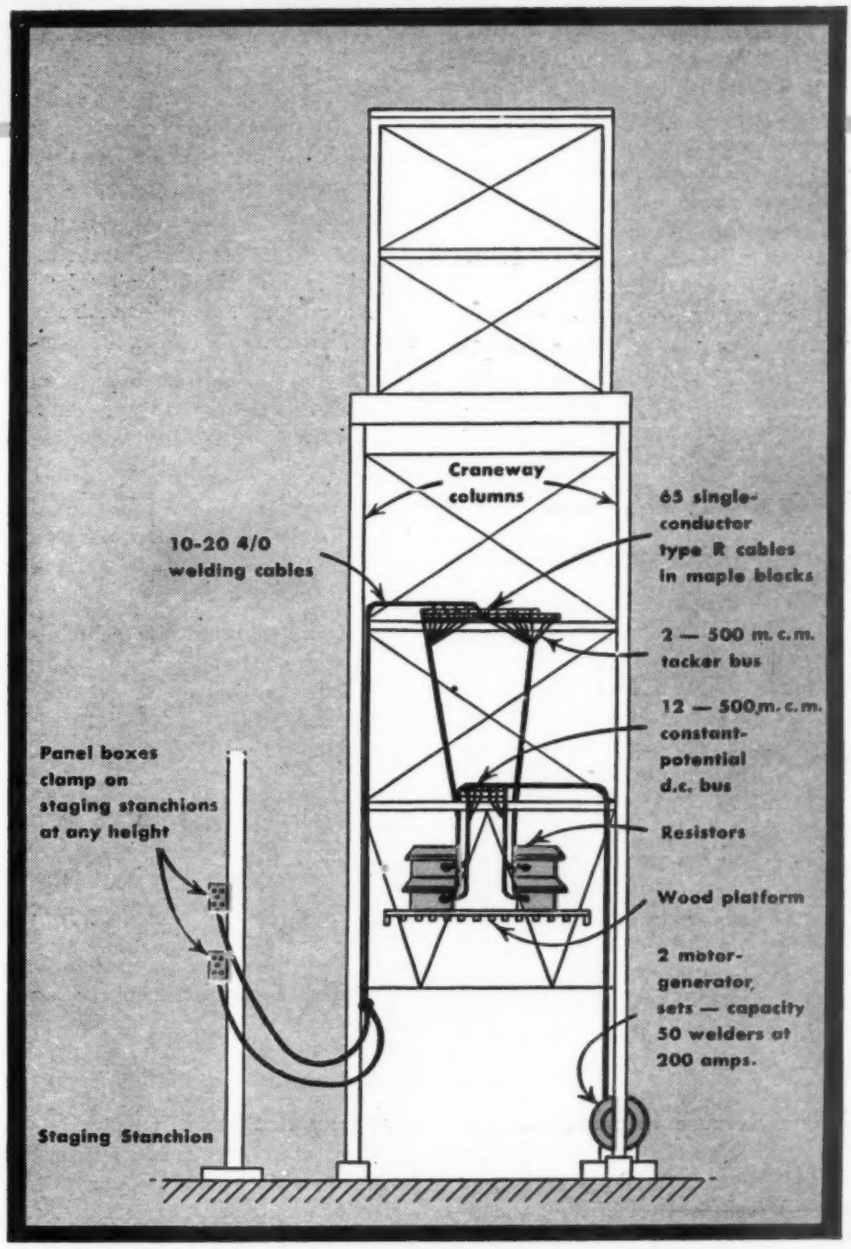
Advantages of the fixed-bus ar-

AYOUT AT CRAMP SHIPYARDS



Welding cable taps from overhead Type R conductors loop down to panel boxes which can be clamped to staging stanchions at any height to suit upward progress of hull. Welder is assigned a number so he can pick up his own lead at any convenient point

Centrally located constant-potential generators and resistor boxes supply individual welding circuits extending full length of shipway. Panel boxes are located on staging stanchions at regular intervals along hull


Craneway columns
10-20 4/0 welding cables
65 single-conductor type R cables in maple blocks
2 — 500 m.c.m. tacker bus
12 — 500 m.c.m. constant-potential d.c. bus
Panel boxes clamp on staging stanchions at any height
Resistors
Wood platform
2 motor-generator sets — capacity 50 welders at 200 amps.
Staging Stanchion

rangement include (1) saving in time of connecting and disconnecting; (2) current can be varied by individual resistors on corresponding cables; (3) assignments are made to welders by cable numbers, thus assuring against the leads being used by more than one welder; (4) less handling, lower investment, and less maintenance than necessary with individual welding sets results; (5) an actual saving in welding cable is effected, and the need for dragging cables long distances over congested areas is eliminated, with resulting lower maintenance costs for cable alone. This new plan also eliminates much worker fatigue resulting from the confusion involved in the old system.

CARTOONS GIVE TECHNICAL INFORMATION TO SUPERVISORS

ROBERT C. BERMAN • DIRECTOR OF TRAINING, HYTRON RADIO & ELECTRONICS CORPORATION, SALEM, MASS.

Supervisors and inspectors in our Lawrence (Mass.) Division badly needed a program of quality instruction. Although they were expected to teach and control the quality of production workers, few of them knew enough to do a really good job. Their knowledge was only on the surface—they knew *how* the job should be done, and *how* the finished part should look, but they didn't know *why!* They were unable to explain quality needs to the operators. Because their own foundation of knowledge was so shallow, they couldn't evaluate the workers' faults—didn't know which quality demands were most important. When a glaring result of poor workmanship was brought to their attention, they weren't sure where they should concentrate to wipe out the fault.

INTERPLANT PROBLEMS

Indeed, this "need for education" often showed up in inter-departmental disputes; a supervisor might complain of receiving "bad" parts that actually were usable, and few supervisors sympathized with the quality problems confronting other departments.

Fortunately, the group of girls we needed to instruct had already had a similar series of meetings on production supervision, wherein we had discussed company policies, wages, organization, and the production phases of supervision.* The "conference" technique had been employed successfully.

This time the problems were different. Because we were going to try getting across information that was *new* (not familiar as before) and *highly technical* (electronic theory and terms), we realized much of the presentation would have to be "lecture." The conference technique, inviting contributions from the students, would not work when they had little to contribute.

Thus, when planning meetings, we had to:

1. Transmit technical and scientific information in terms easily understood, and clear enough to be repeated by the students in their daily work.

2. Present a very uninteresting subject in a manner interesting enough to keep them coming, keep them awake, and avoid "schoolroom atmosphere."

3. Train supervisors to express themselves clearly to operators when correcting quality faults.

4. Give them an understanding of the operations and problems of departments other than their own, and imbue them with a spirit of tolerant cooperation.

First we plotted our schedule. Meetings were to be held after work on Monday and Thursday evenings, each preceded by a dinner at company expense. Attendance was voluntary, but the girls were promised "something different."

The course was divided into four sections:

SECTION I: BACKGROUND. Effects of good and bad quality on the industry, on the company, and on the Lawrence Division in particular; how tubes work, both inside the tube itself and in the radio set; terms and names used in the industry.

SECTION II: SPECIFIC. Origin, function, possible defects, and misuse of each tube part; who is responsible; why it is bad; what is its effect on the finished tube.

SECTION III: COOPERATIVE. Each department's quality problems; its relation to other departments; its operations.

SECTION IV: GENERAL. Quality's connection with incentive piece rates; use of specification sheets for quality control.

We decided to accomplish almost all the teaching by lecture and blackboard. To supplement this we would include (1) audience participation wherever possible, (2) guest lectures by company executives, and (3) cartoons and drawings to illustrate technical data.

The first meeting started as a "short" talk by a company officer who confidently expected to cover his complete subject in fifteen minutes. It developed into a heated question-and-answer session. *At the end of an hour and a half* the group was thoroughly familiar with effects of quality on the industry, the company, and the plant, and knew what quality meant to costs, profits, and reputation. Pride in the job was strengthened, and interest was aroused by the active meeting. Since attendance was voluntary, this last factor was highly important in determining its success.

Our second meeting was devoted to an explanation, in "baby-talk," of how a radio tube works. Although the blackboard was used during the lecture, copies of the talk were distributed as well, since they were available from the previous production course where the same subject had been covered. Although this was "repeat" information for many of the students, they welcomed it readily as a needed refresher. The subject was treated in greater detail

*"Better Supervisors—Because They Know Their Product," FACTORY, Dec., 1945.

than before, because it would form the basis for instruction in future meetings. Heavily cartooned and simplified, the explanation got across a complex theory in layman language.†

In the third meeting we covered explanations and definitions of terms and tube types commonly heard in the plant. A cartoon was prepared, showing how each radio receiving tube does its work in a typical home radio set. This made the subject a *personal* matter to the group, and for the first time put some meaning in their everyday routine jobs.

Also discussed was the meaning of a "short circuit." In a plant where "SC" was as commonly used as "tube," we found few in the supervisory class who could actually define it; one of our biggest causes of shrinkage was virtually a stranger! Once again a cartoon came to the rescue, and turned out to be the first of a highly successful "Mr. Electricity" series of quality explanations.

At this point we moved into a combination of the *specific* and *cooperative* sections of our program. From the fourth meeting through the eighth, activities were as varied as the techniques used to conduct the meetings.

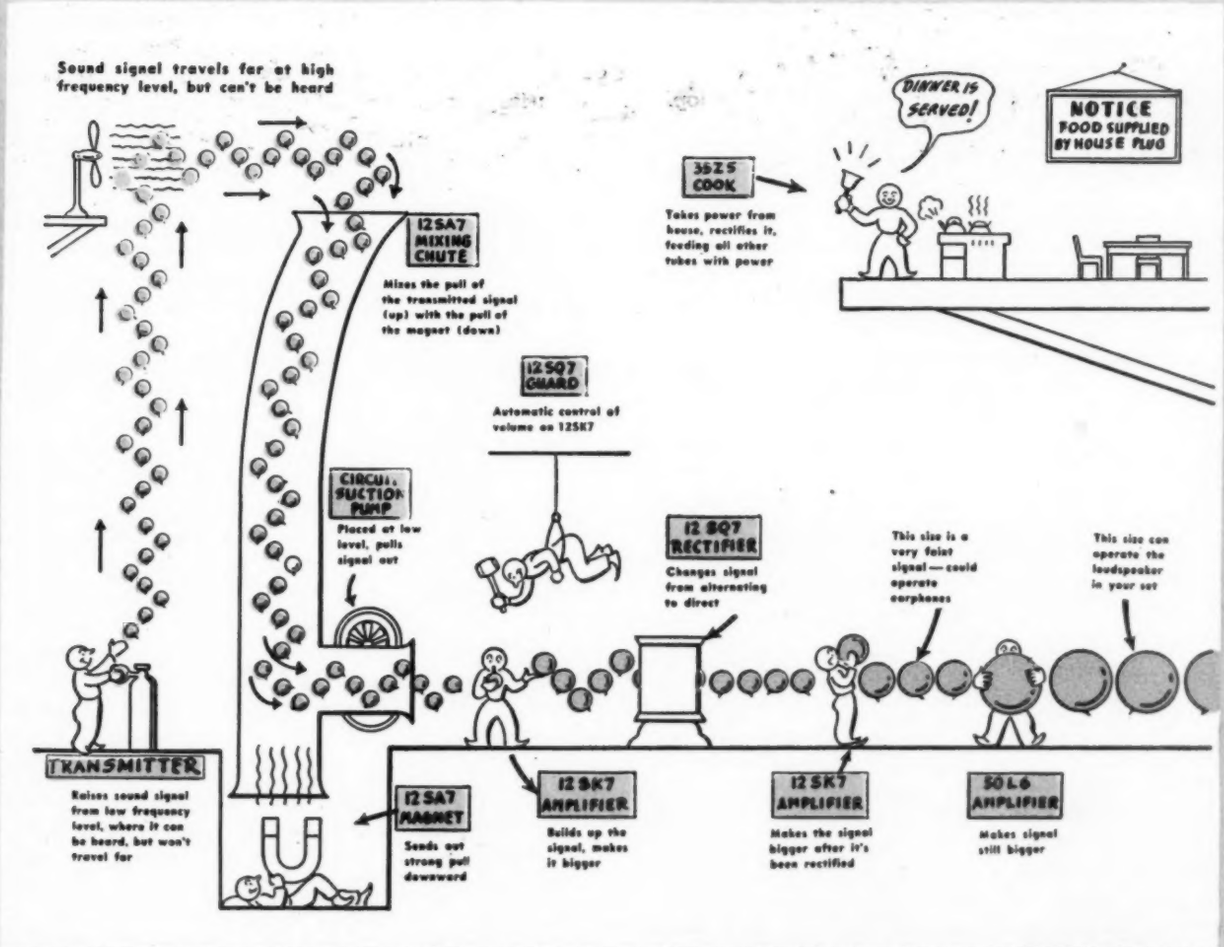
DETAILS DISCUSSED

Each part that is built inside a radio tube was discussed at great length and in great detail. Why it is valuable, how it is made, and what its function is in the overall working of the tube were explained by lecture, with constant references back to the "baby-talk" cartoons distributed at the second meeting.

Actual examples of bad parts were produced and handed around the group, as were sample cases of good ones that had been assembled improperly. Explanations told what was at fault in each case, why it *was* a fault, what its effect would be on a finished tube, and how the faulty operation could be corrected.

In these discussions of poor quality, cartoons and blown-up drawings of bad work were used as much as possible. On such parts as heaters, sleeves, grids, and mica, these cartoons emphasized and clarified many tiny faults that would be al-

†For example of this cartoon treatment, see FACTORY, Dec., 1945, page 101.


Sound signal travels far at high frequency level, but can't be heard
DINNER IS SERVED!
NOTICE FOOD SUPPLIED BY HOUSE PLUG
35Z5 COOK
Takes power from house, rectifies it, feeding all other tubes with power
12SA7 MIXING CHUTE
Mixes the pull of the transmitted signal (up) with the pull of the magnet (down)
12SQ7 GUARD
Automatic control of volume on 12SK7
CIRCUIT SUCTION PUMP
Placed at low level, pulls signal out
12 SQ7 RECTIFIER
Changes signal from alternating to direct
This size is a very faint signal — could operate earphones
This size can operate the loudspeaker in your set
TRANSMITTER
Raises sound signal from low frequency level, where it can be heard, but won't travel far
12SA7 MAGNET
Sends out strong pull downward
12 SK7 AMPLIFIER
Builds up the signal, makes it bigger
12 SK7 AMPLIFIER
Makes the signal bigger after it's been rectified
50L6 AMPLIFIER
Makes signal still bigger

How each radio tube does its work in the home receiving set, is the subject of this cartoon. It is typical of the cartoons used at Hytron to get technical information across to supervisors which will enable them to explain quality needs to operators.

most unnoticed by the naked eye.

Also used in conjunction with the lectures were additions to the "Mr. Electricity" series started so successfully in the third meeting. These really added humor and interest to the technical subject, while getting the point across, and giving examples of actual cases.

When the lectures covered the function of "stems" (glass and metal supporting structures on which the whole inside of the tube is built), cartoons helped us to explain operations being done in other departments with which members of the group were totally unfamiliar. Many of the jobs they learned about were done in Hytron's other plants, in other cities, to which the Lawrence Division delivered most of its finished work.

FOREMEN HELPED

The fourth to eighth meetings were not *all* lecture and cartoon, however. Foremen, acting as guest speakers, explained the headaches each had in trying to run his own department. They were instructed to pretend each student had been offered the foreman's job and was seeking his advice about accepting the offer.

Needless to say, the foremen pitched in wholeheartedly. To them it was an ideal chance to air dissatisfactions. Not only did this method contribute humor and relief of strain from the technical nature of the meetings, but at the same time it enabled the students to understand the problems of others. These "guest lectures" provided:

1. Interesting and valuable information about unknown parts of the plant.

2. Clearer evaluation of the cost of poor work.

3. Growth of an interdepartmental cooperative spirit.

Each foreman's talk was scheduled for the same night on which his product was discussed. For example, the Grid Department foreman spoke on the same night that grids were explained, etc. This helped to tie the *specific* and *cooperative* sections together more closely in the girls' minds.

In conjunction with his guest lecture, each foreman conducted the group on a visit to his own department. Arrangements had been made in advance for enough workers to be operating that night so the students could actually *see* the operations being described in the lecture.

Thus we were successfully overcoming the first, second, and fourth of the problems we faced when we started out. But how about the third? What was being done to train the supervisors to be able to express themselves later, after the course was over?

We decided the best way to accomplish this was by using the "project" method of instruction. After the fourth meeting, when we had begun the *specific* lectures, students were invited to find examples of the poor quality discussed at any one meeting and bring them to the next class for presentation to the group.

At first the number of volunteers was small. The few "brave" ones were timid and unsure of themselves, stuttering out their stories, and developing nervous laryngitis. As they progressed, however, and were helped along by the teacher, their self-confidence gradually strengthened, and the hilarity of the rest of the class changed to interest and a desire to join in. Volunteers grew in number.

PLAN PROVED POPULAR

By the end of the eighth meeting *every member* of the class had worked out and presented at least one project. The girls found this work so much fun that several times, when the evening's lecture ran longer than planned, they were noticeably disappointed that time wouldn't allow projects to be presented that night! Many of these projects were so carefully and thoroughly prepared that we used them afterwards as instruction displays for factory workers. And thus the supervisors learned, "by doing," the skill of explaining a quality fault to an operator.

The eighth meeting closed the *specific* and *cooperative* sections and a recess of one week was announced. To the girls this was a welcome relief from the regularity of our schedule. When the next class met a week later, opening the first *general* section of the course, the students were refreshed and keen to begin on the next step.

For a long time there had existed an underlying feeling that the production piece rates were too tight to be hit by an operator doing quality work. It was believed that no worker could produce a lot and still produce good pieces. It was up to us to convince the supervisors, and through them the workers, that high quality and high earnings could, and usually do, go hand in hand.

The ninth meeting lecture was delivered by a company industrial engineer. After explaining job rating, he took the class through all the details of preparing and working out a time study, then molding the results into a piece rate. He explained that the final rate is based on (1) an average (2) experienced operator (3) diligently (4) doing quality work (5) according to the correct method.

TIME STUDY TRAINING

This whole meeting was conducted as if each student were actually training to be a time study man. Pencils and time study sheets were handed out, and the girls took a "study" of the teacher as he went through the motions of a sample operation. Needless to say, they got utterly confused after the first few elements. They were amazed at the difficulty of watching the pencil, paper, operator, and stopwatch all at the same time, and interested in the "operator rating" function that converted actual times to normal.

The leader took advantage of their sheepishness to drive home his point: The rate allows all the time needed *to do the job correctly.* Quality and speed *can* go together. Graphs covering months of actual production proved to the group that, up to a very high point as yet unattained, quality improves as production increases! The supervisors ended up with a new respect for the skill of the rate setters, and a new attitude toward the relation of quality to output.

The tenth and eleventh meetings, devoted to an explanation of how to

read and use the company specification sheets, were handled as projects by "teams" of students. Sample sheets were handed out, and each team took one type of "spec" to explain to the rest of the group. Heated arguments arose about interpretation, and the subsequent question-and-answer sessions revealed many old misunderstandings and original training omissions.

The course was just about over. In the next two meetings the complete *specific* section was summarized, but in a different way. Each tube *part* had been discussed in full; now each *tube type* was covered, its parts listed and described in reference to previous meetings, and its name and use reviewed in terms of the cartoon used at the third session. Sample tubes were handed out so the girls could follow the summary with their eyes. These last two meetings, then, became a cross-index of the course of tube types.

What had we accomplished? Were our supervisors more valuable to themselves and the company because of the meetings? Here is what we found:

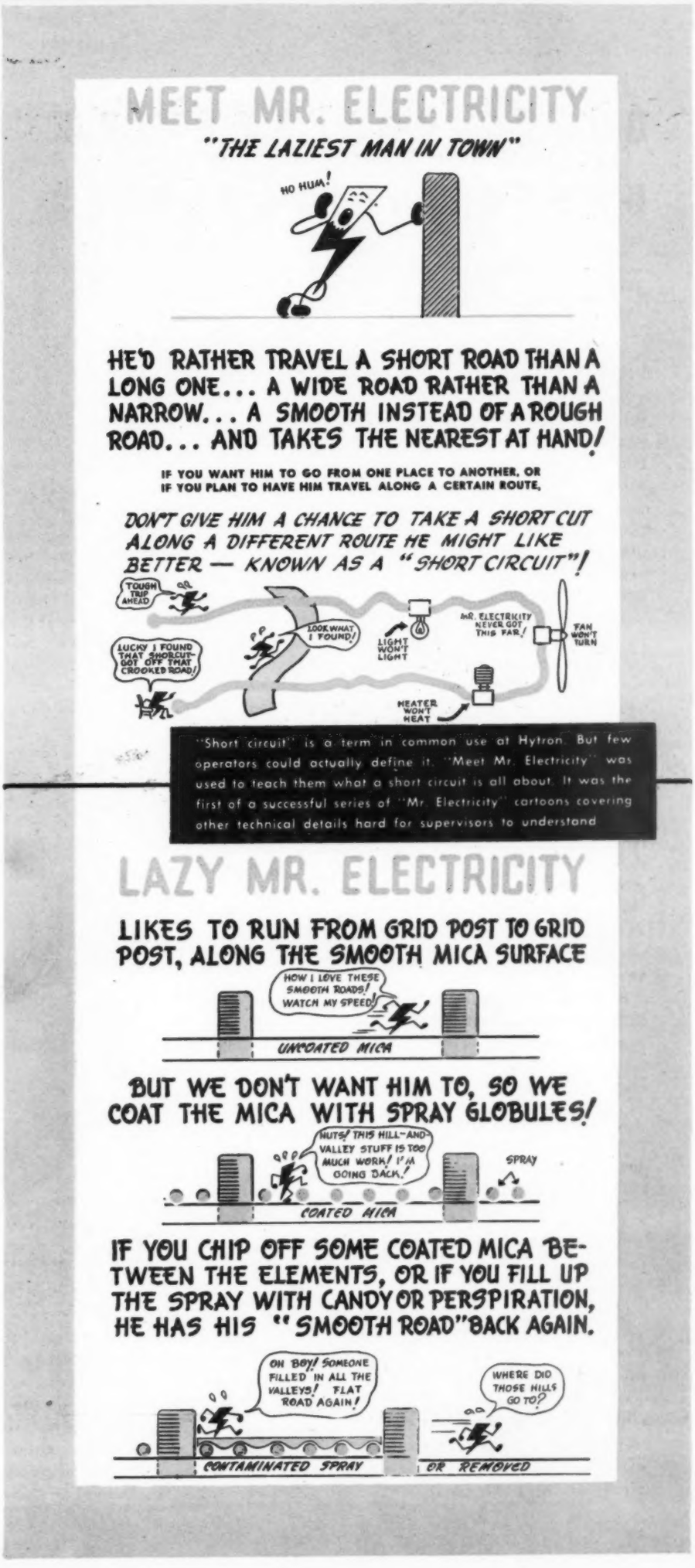
1. The supervisors had gained a clear and detailed understanding of quality requirements, and the causes and results of all kinds of shrinkage. They had a complete picture of *why* and *how* as well as *what*.

2. They had learned the technique of recognizing, investigating, explaining, and correcting quality faults of operators. They were more confident of their ability to get the point across.

3. A booklet, reprinting the bulk of the course and most of the explanatory pictures, was prepared and given to each student after a unanimous demand for same. These are used daily in explaining quality to operators by referring to the available cartoons.

4. Supervisors were convinced that, under ordinary conditions, good production and good quality are not opponents, but allies.

5. We had promoted a greater understanding of the problems of other departments. Through this had been developed a broader tolerance and a wider acceptance of mutual responsibilities.


MEET MR. ELECTRICITY
"THE LAZIEST MAN IN TOWN"
HO HUM!
HE'D RATHER TRAVEL A SHORT ROAD THAN A LONG ONE... A WIDE ROAD RATHER THAN A NARROW... A SMOOTH INSTEAD OF A ROUGH ROAD... AND TAKES THE NEAREST AT HAND!
IF YOU WANT HIM TO GO FROM ONE PLACE TO ANOTHER, OR IF YOU PLAN TO HAVE HIM TRAVEL ALONG A CERTAIN ROUTE,
DON'T GIVE HIM A CHANCE TO TAKE A SHORT CUT ALONG A DIFFERENT ROUTE HE MIGHT LIKE BETTER — KNOWN AS A "SHORT CIRCUIT"!
TOUGH TRIP AHEAD
LUCKY I FOUND THAT SHORTCUT— GOT OFF THAT CROOKED ROAD!
LOOK WHAT I FOUND!
LIGHT WON'T LIGHT
MR. ELECTRICITY NEVER GOT THIS FAR!
FAN WON'T TURN
HEATER WON'T HEAT
"Short circuit" is a term in common use at Hytron. But few operators could actually define it. "Meet Mr. Electricity" was used to teach them what a short circuit is all about. It was the first of a successful series of "Mr. Electricity" cartoons covering other technical details hard for supervisors to understand
LAZY MR. ELECTRICITY
LIKES TO RUN FROM GRID POST TO GRID POST, ALONG THE SMOOTH MICA SURFACE
HOW I LOVE THESE SMOOTH ROADS! WATCH MY SPEED!
UNCOATED MICA
BUT WE DON'T WANT HIM TO, SO WE COAT THE MICA WITH SPRAY GLOBULES!
NUTS! THIS HILL-AND-VALLEY STUFF IS TOO MUCH WORK! I'M GOING BACK!
SPRAY
COATED MICA
IF YOU CHIP OFF SOME COATED MICA BETWEEN THE ELEMENTS, OR IF YOU FILL UP THE SPRAY WITH CANDY OR PERSPIRATION, HE HAS HIS "SMOOTH ROAD" BACK AGAIN.
OH BOY! SOMEONE FILLED IN ALL THE VALLEYS! FLAT ROAD AGAIN!
WHERE DID THOSE HILLS GO TO?
CONTAMINATED SPRAY
OR REMOVED

GOOD HOUSEKEEPING UNDER DIFFICULTIES

R. BERNHEIM • PRESIDENT, R. NEUMANN & COMPANY, HOBOKEN, N. J.

So you think your processes are too dirty to permit good housekeeping? That's the attitude responsible for many sloppy and unattractive work places. But it need not be.

Consider the handicaps in a plant that has as many housekeeping headaches as a tannery, and yet manages to whip them.

Tanneries have long been notorious as places that are seldom kept clean. Raw smelly hides are processed under conditions that make for wet floors littered and slippery with scrapings of fat and other waste. Hair and refuse pile up from hide-cleaning operations.

To add to these factors that are general throughout the industry, Neumann's problem is made more difficult because one of the company's three buildings is 50 years old, and the newest one is already 25 years of age. Moreover, the neighborhood in general is a dirt and dust producer.

Starting out with these conditions that mitigate against good housekeeping, Neumann decided to do something about it, for these three reasons:

1. Cleanliness and good order throughout the plant contribute to the making of the quality products that this plant specializes in.

2. Housekeeping contributes to safety, good will, employee morale, low upkeep costs, reduced work fatigue.

3. The company wants to help counteract the impression that a tannery must necessarily be a messy smelly place.

In consequence plant visitors at any time will find the floors clean, work areas tidy, cleanups in progress all over the plant. Not only are outsiders quick to observe the favorable appearance of the plant, but all employees here have an awareness of good order.

The explanation lies in the fact that the thinking behind the housekeeping program starts at the top and reaches out through supervisors and foremen to every individual working for the company.

The housekeeping routine employed in the tannery is simple and direct. Management leads in providing for and promoting good order. Foremen are held responsible for cleanliness throughout their departments, and they in turn require that each employee take care of his own work area.

Fourteen departments do widely varying work. Each fits its cleaning routine to the nature of the work being done.

In the wet process departments, the floors are regularly washed down with hoses. Here messes are made constantly; that is in the nature of the work. They are cleaned up right away; that is in the nature of what is expected. New equipment, now on order, will pump refuse away from individual machines, thus saving time and simplifying the work that is now done by hand.

In most departments, a regular cleanup period is scheduled just at quitting time. The amount of cleaning is determined by the foremen. Workers must have departments looking spic and span when they finish work.

Three employees are assigned to housekeeping duties exclusively. They clean offices, corridors, washrooms. Although they are superannuated employees, their work—under the system in force and because of the emphasis placed on it—is unusually satisfactory. Elevator operators and similar employees

The Neumann housekeeping formula meets its most severe test in the hide house where green salted hides are run through fleshing machines. Here it's just a case of everlastingly keeping at it

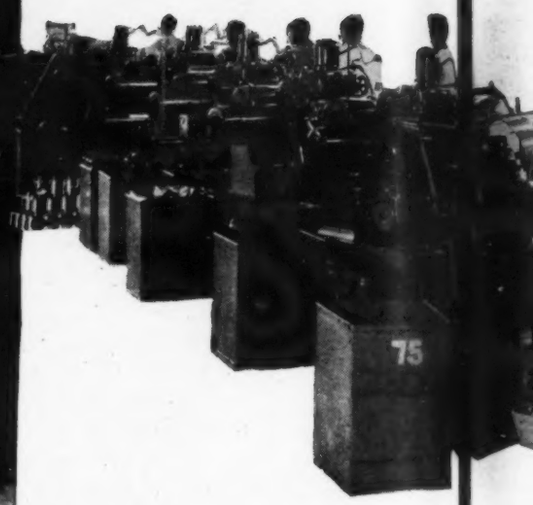
Skins are dyed in the color house. Processes are wet and messy. But clean-up, including regular hosing of floor, is part of the day's routine with workers, and, despite the nature of the process, the department is always a perfectly decent place to work

when free from their regular duties help tidy up corridors and other open areas.

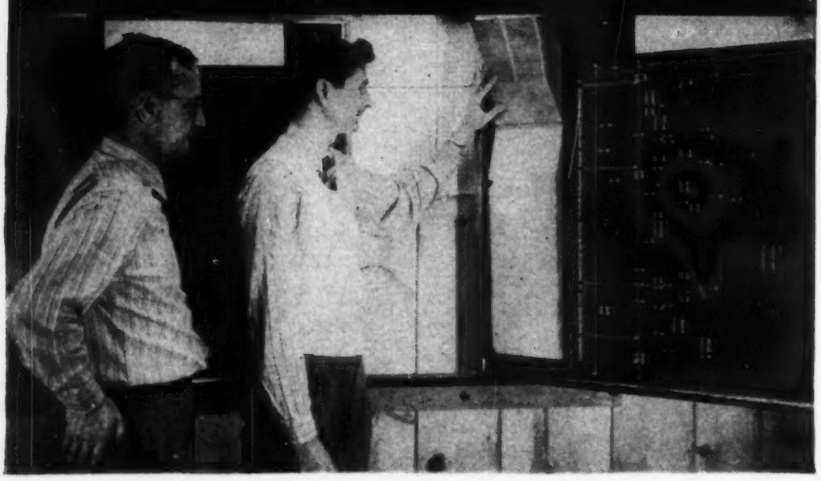
Maintenance men do their part to help improve the appearance of the plant. At almost any time during the day some maintenance worker will be employed in raking up yard areas, cleaning storerooms, adding to the sum total of effort that makes the housekeeping thorough.

A safety committee conducts a monthly inspection throughout the plant. Its recommendations often deal with improvements for the housekeeping phases of safety and the elimination of fire or other hazards. Monthly foremen's meetings are frequently devoted in part to plant-wide good order.

After seeing what the good housekeeping program has accomplished in wet process departments, one expects to find the Neumann shipping unusually sweet and clean—and it is



Modern management techniques enable the author (seated above) to keep his finger on all phases of plant operation. Production control system (below) embodies newest in methods and equipment



MANAGEMENT TECHNIQUES IN A SMALL PLANT

CHARLES F. STEIN • GENERAL MANAGER, TRI-CLOVER MACHINE COMPANY KENOSHA, WIS.

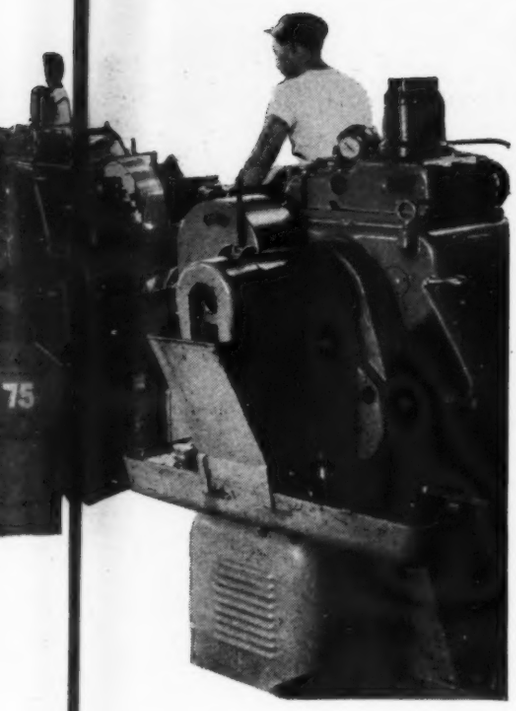
That modern management techniques can be successfully applied in the small plant is demonstrated at the Tri-Clover Machine Company manufacturing plant.

In this 225-man shop, where 30,000 operations are performed on some 6000 parts for food processing and chemical equipment, most of the "tools of management" often dismissed in small plants as "big plant stuff" have been put to work.

The result—*profits to company, workers, and customers.* By using these tools of management, Tri-Clover has increased its overall plant efficiency from 70 to 117 percent. Wage rates are now the highest in the community. Production costs have been lowered.

Frankly, there is nothing in Tri-Clover's operations that makes it a "natural" for such big-plant tools as job evaluation or statistical quality control. Other small plants can use them just as easily as we do. In fact, many small plants with simpler production problems than Tri-Clover's may be able to install and use these tools even more easily than we are doing.

To help management in small plants apply these tools, I shall outline their applications at Tri-Clover briefly. They can be classified under three main headings—employee re-



lations, production methods, and management controls.

Our personnel department, of course, is responsible for most of the services for employees. Handling personnel records, maintaining bulletin board and poster services, arranging free legal advice and free income tax service, and administering group life, health and accident, hospital and surgical insurance are only a few of the department's jobs.

The department supervises safety conditions, providing goggles and protective clothing when necessary, and has a registered nurse to give first aid and visit the homes of ill employees.

The department also sees that each company employee gets a box of candy on his birthday and a letter from the president on each anniversary of his stay with the company. It presents service emblems on the 5-, 10-, 15-, and 20-year anniversaries, and a gold watch to those with a quarter-century of service. It administers a profit-sharing pension plan, a vacations-with-pay plan, and a Christmas bonus when profits justify it. Loans are arranged through the employees' credit union. Veterans are given any special attention they need to readjust themselves to civilian living and working. A club for social and recreation activities rounds out the personnel department's contacts with employees.

Workers are kept in close contact with management in other ways, however. A suggestion plan open to all employees gives them quick action on any ideas they may have. Collection boxes are opened daily, and each suggestion is analyzed immediately. The suggester receives 20 percent of the first year's savings as his reward. In addition, an "ACE" pin is given suggesters whose awards total a stipulated amount.

Weekly conferences are attended by each foreman, supervisor, and group leader. Under the conference plan, department heads alternate in leading the sessions, except that every second meeting is led by an outside expert on foremanship. Visual aids in the form of film strips and movies, both in sound, are utilized to good advantage.

Subjects embrace all the matters that leadership and foremanship require, both background material and specific problems. For example, personnel problems, finance and budget, handling people, quality control, work simplification, and many other tools of management are discussed. Minutes are kept of each meeting and bound into individual folders.

A weekly management information service is subscribed to for each foreman and supervisor to use and read. A large library of technical books, magazines, and pamphlets is available to all members of the supervisory staff.

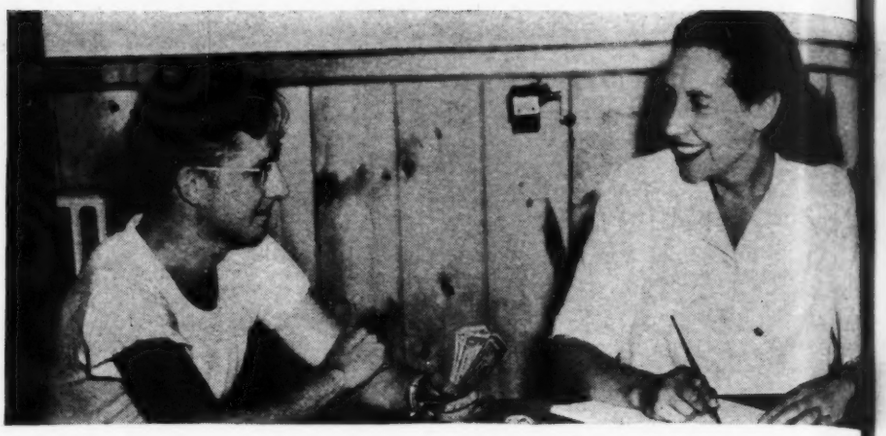
Workers are kept in close contact with management in as many ways as possible. The suggestion plan is organized to give them quick action on any ideas they may have—and they get 20% of the first year's saving

CONTINUED ON NEXT PAGE

PRODUCTION METHODS

Statistical quality control is an important production tool here. A control chart is kept for each machine operation. When a production run is started, a floor inspector checks the first parts for dimensional accuracy. Dimensions are plotted for each part of the chart. During the run, the inspector periodically samples lots of equal numbers and plots the results. If part dimensions are not within the statistically established limits, a set-up man checks the machine and tools before more parts are made.

Wage incentives, based on standard time hours of performance with rates established by synthetic analysis, are used throughout Tri-Clover. Base pay is guaranteed and any complaints concerning time allowances are investigated promptly. If, on investigation, allowances are found to be too low, they are immediately adjusted. If they're right, a demonstration is given the operator and he is coached until he's satisfied. If allowances are too high, they remain in effect until there is a change of method on the operation.



The Personnel Department, of course, is responsible for most of the services for employees. Handling personnel records, arranging free legal advice, and taking care of loans through the Credit Union are among its jobs

Operation routing sheets have been developed from the incentive system. Routing sheets, with information on wage rates, operation sequence, tools and their location, and machines for the job, are used in cost determination, collection of tools and supplies for the run, and the setup of orders and production control boards covering the job.

Job evaluation, allowing points for skill, effort, type of work, and special conditions, is used to classify all jobs in the plant.

Standard instruction sheets, made up after studying and standardizing all job procedures, are bound in looseleaf notebooks. Issued to key personnel, these instructions are followed until a change is agreed upon. All rules, forms, and policies are described and proper procedures established.

Work simplification has been an important tool in increasing the plant's efficiency. When the program started, each worker, from the president to the janitor, was put through a training program to acquaint him with the importance of job improvements and cost reduction. Workers were trained on the job; supervisors, in a series of weekly conferences.

Objectives of the program—and the plant has made progress on all of them—were more and better jobs at higher wages with improved quality through new product design, better work methods, and increased sales at reduced sales prices.

Mainstay of the entire job improvement program is the industrial engineering department. Men in this department are specifically trained for specialized functions. How important management believes the department to be can be seen from this list of its responsibilities—wage incentives and work routing, time and motion study, standard instruction sheets, suggestions, cost estimation, new equip-

Each Tri-Clover employee gets a box of candy on his birthday, and a letter from the President of the company on his employment anniversary—as well as service pins for 5-, 10-, 15-, and 20-year anniversaries

ment purchases, quality control, statistics and charts, job evaluation, and even publication of a small house organ.

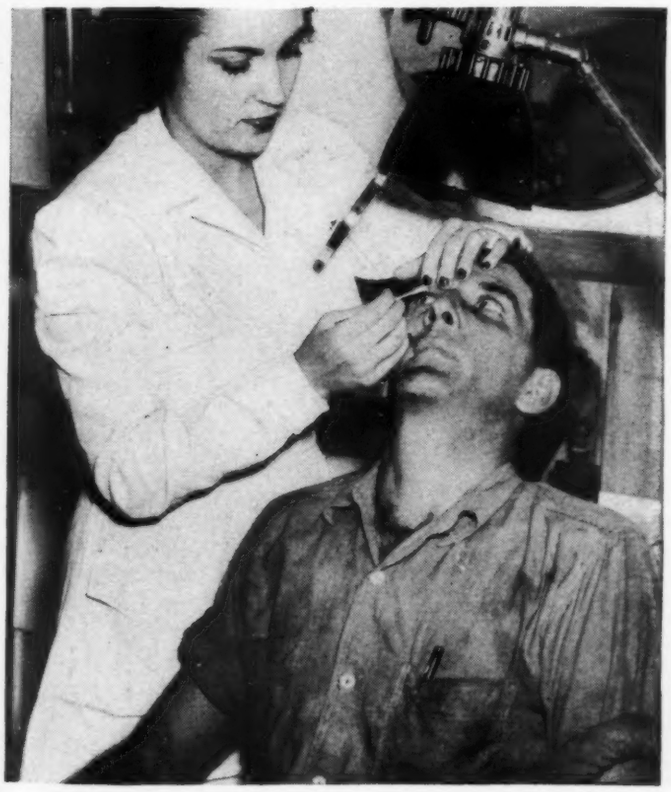
MANAGEMENT REPORTS

With complicated production schedules, management needs frequent specific reports to do its part in increasing efficiency. Twenty-three managerial reports covering daily, weekly, and monthly operations include these:

Indirect labor over hours worked by departments, average hourly rate by departments, payroll and hours worked by weeks, overtime hours and cost by week compared with straight time hours, direct and indirect labor weekly, percentage of productive to non-productive labor weekly, percent of payroll to shipments by months, shipments measured in dollars and in weight by shipping days, monthly shipments, unshipped orders on hand, inventories of items in stock, of raw materials, of finished parts, and of office and miscellaneous supplies, kilowatt consumption and cost by months compared to productive hours, the waste report by departmental rework figures and total scrap, the frequency and severity rate of accidents, budget reports with realization, loss and actual figures, and employment with turnover and absenteeism.

Tri-Clover management is a firm believer in the "personal touch." Instead of mailing an insurance check to a disabled employee, the Personnel Manager takes the trouble to deliver it in person

Under the direction of the Personnel Department is the registered nurse who is always on hand to render first aid, and visit the home of employees who are too ill to come to work



These reports—and other routine reports—are produced on the punchcard system and reproduced on a duplicator so that each executive has a copy.

These are the management tools we believe have helped Tri-Clover most in increasing its efficiency. The plant has, of course, the old standbys, too—engineering, plant layout, production and inventory control, and others. Our layout department, incidentally, is now preparing to use three-dimensional scale models, and production and inventory control records are kept by the visible card method and control boards.

Tri-Clover's record more than justifies the use of these modern management tools in a small plant. With their help, the company is meeting the challenge of the post-war era to its people, its competitors, and its customers.

AN EFFECTIVE STEAM TRAP MAINTENANCE PROGRAM

E. D. SMITH • PLANT ENGINEER, NATIONAL CASH REGISTER COMPANY, DAYTON

Steam traps don't work efficiently forever. They need routine inspection, and sometimes repair, and failure to give them this attention may cause needless trouble production-wise. Often needless waste of money, too, because of inefficient trap operation.

These facts, backed by actual findings at NCR, led to the setting up of a definite maintenance program for servicing about 4000 steam traps in its Dayton plant. An important byproduct of this program has been the formulation of specifications for selection and installation of steam traps to prevent recurrence of abnormal troubles found.

It took a serious problem in the operation of a group of plastic molding presses to clinch the decision for scheduled steam trap maintenance. The platens of these presses first are heated by steam at 160 psi., and then cooled by passing water through them. After several years of idleness, these presses were relocated and put into service, but steam consumption was found to be 3000 pounds of steam per hour instead of 1200 pounds as formerly. Also, the platens were not heating up properly.

To correct the situation, it was first planned to raise steam pressure to 400 psi., which would have involved considerable expense both in redesign of the platens and the installation of 1600 feet of 400-lb. steam line.

Before taking such steps, however, a survey was made of all equipment to insure its giving the best possible service. Most of the bucket-type steam traps in the steam lines to the presses were found to be blowing through, which was caused by loose, worn, or even missing buckets, and leaking valves. After repair of these defects, the steam consumption dropped back to the original 1200 pounds per hour.

But this improvement did not last long. Every few days one or two traps would start blowing through, resulting in poor machine performance. Further investigation showed that the traps were too large for the job, and that traps of only one-third the capacity should be used. Also, in some cases the inlet piping was so laid out that under certain conditions the condensate circulated back into the trap, causing the bucket to drop and never close. By rearranging the steam inlet line so

Why not a specialist whose business it is to overhaul and repair steam traps that go wrong? NCR finds it pays to carry such a man on its maintenance staff

that the whole line was higher than the trap, this latter difficulty was eliminated, and excellent machine performance was maintained thereafter.

In order to make sure that all steam traps at NCR are always in good operating condition, the following maintenance program is now in effect:

1. All main line or unit traps, ¾ inch or larger, are blown daily by use of a telltale connection.

2. Traps under ¾ inch on individual units are tested at least every 6 months, and repaired where necessary. Incidentally, repairs have been required mainly to valve seats and buckets.

3. Trap returns from heating coils of hot water tanks used for showers, laundry, and similar purposes are checked frequently to make sure no hard water is leaking into the condensate.

4. Low-pressure traps in branches of heating system (not mains) are checked every 5 years. Bellows, seats, or other parts which are found defective are replaced.

5. Commencing each heating season, all dirt pockets in steam lines are cleaned out.

CHARTS EXPLAIN OPERATION

To help the maintenance department understand how steam traps work, and therefore do a better job of servicing them, enlarged cross-sectional views of the various types in use have been posted on a wall of this department.

Chief among the rules derived from NCR trouble-shooting experiences for proper installation and functioning of steam traps are:

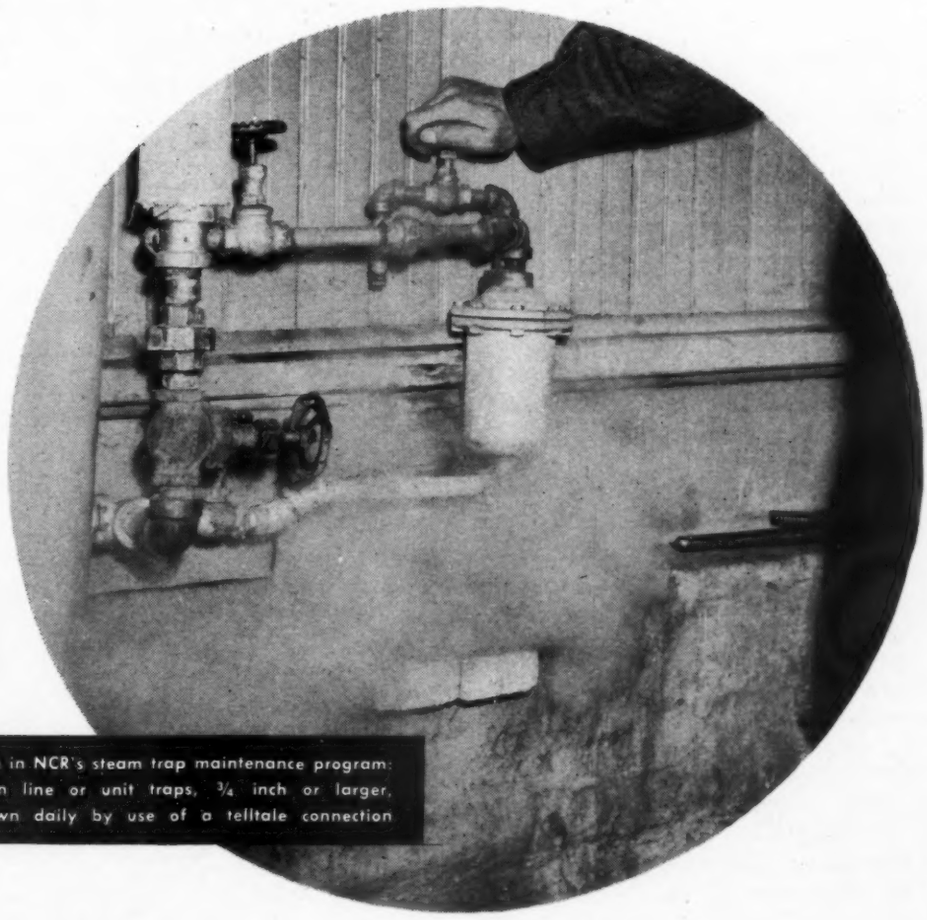
1. No trap is allowed to serve more than one tank heating coil or other heating unit. The former practice of one trap serving several units was discontinued because some of the units were found to be condensate-logged.

2. Wherever heating coils are installed in plating tanks, soap tanks, or on any equipment where the condensate might become polluted or unsuitable for boiler make-up, the trap discharge is dumped to the sewer.

3. Wherever a process tank is heated by an open steam connection, double check valves are mounted at the top of the riser feeding the tank. These valves act as vacuum breakers, and in case of steam shut-off prevent process liquid from being sucked back into the steam line and drained through the main steam line traps back into the boilers.

4. Perhaps a step overlooked most of all until its importance to satisfactory operation was discovered, traps are checked before installation for proper rating and orifice size with due regard to steam pressure.

Since its inception over a year ago the steam trap maintenance program is paying off so well, even from a cost angle alone, that it is now considered an essential contribution to smooth production and lower maintenance costs.



Step one in NCR's steam trap maintenance program: All main line or unit traps, ¾ inch or larger, are blown daily by use of a telltale connection

PHOTOGRAPHS OF SCALE MODEL LAYOUT SIMPLIFY PLANT CHANGES

R. F. BARTLETT • PLANT ENGINEER, VICTOR ADDING MACHINE CO., CHICAGO

Close-up photographs of three-dimensional scale models now accompany all orders for layout changes at Victor Adding Machine Co. This is but one of the advantages that has come from the use of a sectional scale model of the entire plant area.

Executives, engineers, and production supervision have a better understanding of layout problems because plant facilities, equipment, and machinery are shown clearly with the aid of these actual model reproductions. The tedious drafting and repeated explanations that were necessary under the old system have been completely eliminated.

WORK ORDERS

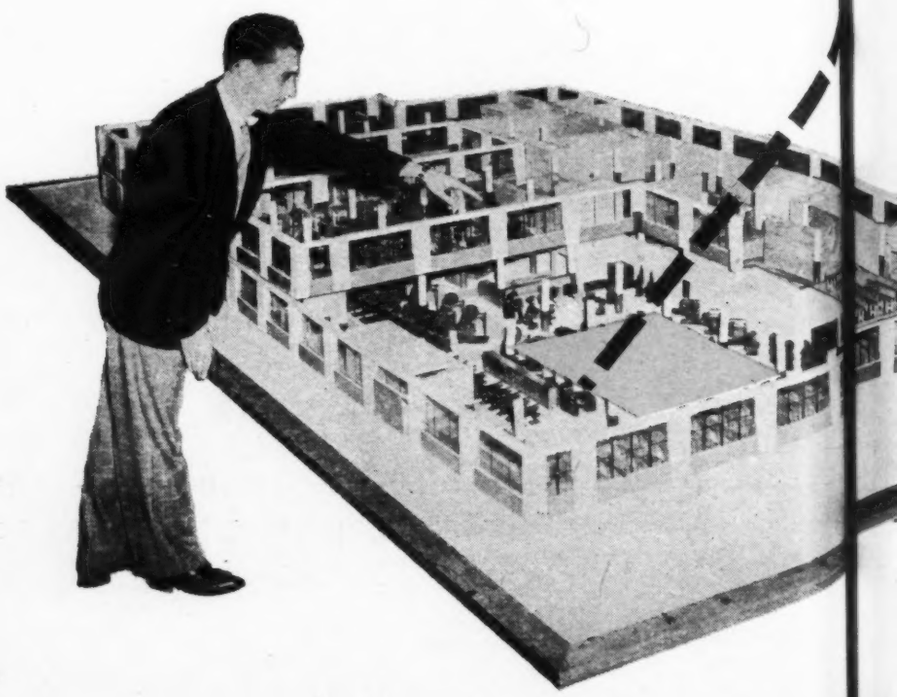
When expansion of facilities, better methods, or the introduction of a new product necessitates a layout change, the plant engineer determines the requirements, and proceeds to set up the new area on the scale model. After this has been completed, the foreman and necessary management representatives review the plan as it is shown on the model board. After any objections have been corrected, a photograph is made of the complete model. Either close-ups or enlargements are made of the areas immediately involved in a particular change. On these it is possible to show in graphic detail the exact sequence of the moves involved.

Prints of the photographs are attached to each copy of the maintenance work order sent out. Each machine in the new arrangement is numbered right on the photograph, and these numbers are "keyed" to the list of numbers on the order itself. For reference purposes, each column in the plant—and in the model—is grid-indexed numerically and alphabetically, in much the same manner as a road map. All "geographical" directions in the work orders are based upon these column designations. For example, the order shown calls for the first machine to be located a specified number of feet from column 5D.

One of the most helpful features of the three-dimensional scale model is its sectional construction. This enables parts of it to be studied and worked on at close range, eliminating what might otherwise be clumsy distances on the full model. The model board itself is 10 by 16 feet, and is supported by interlocking wooden horses mounted on rollers. Scale is one-half inch to the foot. The complete model can be assembled from scratch by two men in about two and a half hours.

When revisions are under consideration, photographs are made of the immediate area and, if it seems desirable, of the entire model, thus permitting the proposed

When a layout change is needed at Victor Adding Machine, it is first worked out in every detail on the scale model. A closeup photograph of the area involved in the change is then made; it accompanies the maintenance department's order authorizing the move, and serves to augment and clarify the instructions in the order. Below, author points in general direction of area to be changed



MAINTENANCE ORDER

VICTOR ADDING MACHINE CO.

ORDER DATE 9-19-45 **DATE WANTED** 9-24-45 **ORDER NO.** MDK 1836

CHARGE TO 532-16 **DELIVER TO** ..... **DRWG. NO.** Photograph 1-B

INSTRUCTIONS

Move machines marked from one to eleven from the third floor locations listed to area as per photograph, starting at post 5D. Front edge of machine shall be 39" north, and west side of table 11'6" east from center of column. Machines are to be 34" apart from table to table.

Hook-up all machines electrically to wireway above.

Machine Number	Asset Number	Location
1	1346	3rd Floor Machine Shop
2	1113	" " " "
3	1236	" " " "
4	1237	" " " "
5	1238	" " " "
6	1421	1st " " "
7	1521	1st " Tool Room
8	1347	3rd " Machine Shop
9	1422	1st " " "
10	1300	" " " "
11	1301	" " " "

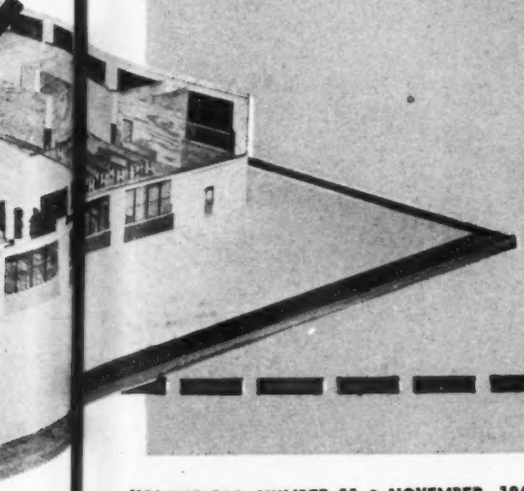
MATERIAL

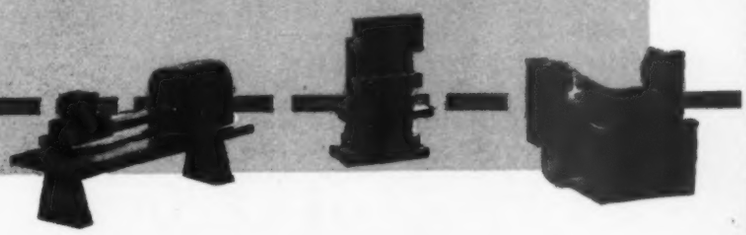
165' – ¾" conduit
200' – ½" conduit
500' – #10 Wire
500' – #10 Wire

Miscellaneous anchors and fittings as required.

ORDER ISSUED BY	ORDER CHECKED BY	ORDER APPROVED BY
		ESTIMATED COST
ASSET RECORDS	PLANT DRAWING CHANGED	MATERIAL
		LABOR
ACTUAL COMPLETION DATE	COMPLETED JOB OK'D BY	TOTAL EST. COST

331-346





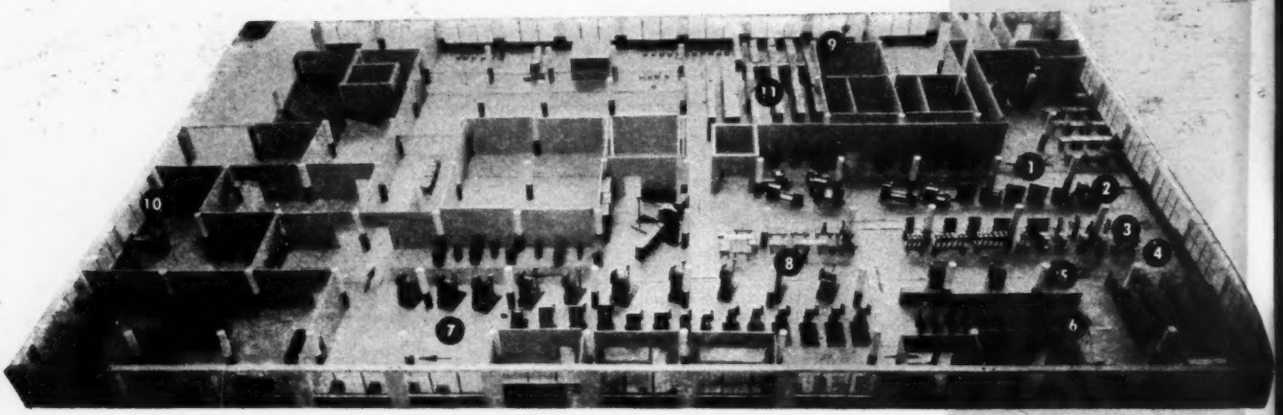
changes to be viewed in their proper perspective to the plane as a whole. Often an entire series of possible changes is photographed and these photos are filed with any possible objections. This permits all proposed plans to be studied side by side when the decision is made at a later date.

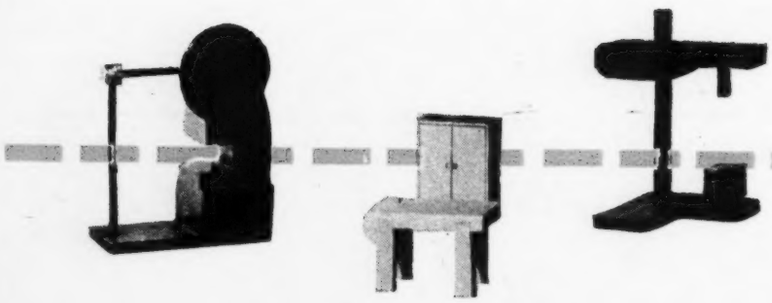
The sectiona. principle has been extended beyond the model board to cover the individual models of pieces of machinery and equipment. Standardization of many of the parts used in the construction of these models has permitted them to be produced speedily and cheaply by the men in the maintenance department. Most of the models cost less than 75 cents each to build; some cost as little as 10 to 25 cents.

Comparative efficiency of the old and new systems from a purely man-hour point of view is worth noting. Under the old method of using cardboard templets, changes had to be redrawn so that the required departments would have a working drawing to use in making the change. It took three skilled draftsmen to handle the volume of work. The occasional services of a photographer do the entire job now, and with many fewer hours spent in interpretations and explanations.

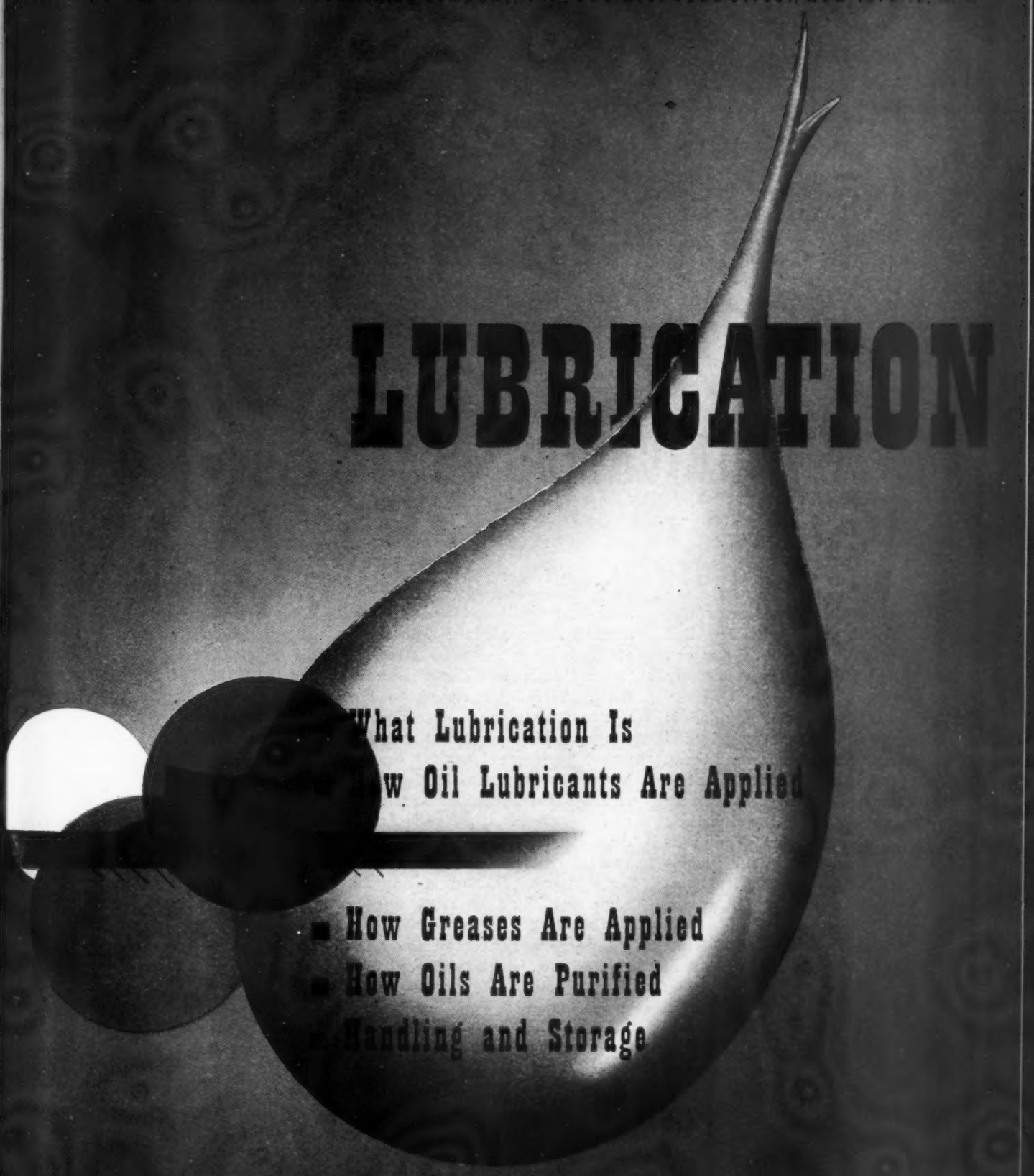
At least two other advantages have been found to be of major importance. Handling has been simplified because it is now easy to show visually the movement of parts from one department or machine to another. This is especially valuable in cases where vertical flow is involved. Also it is possible to follow service lines—gas, steam, power, water, and air—with a view to locating machinery where the installation cost will be minimized.

Photograph of scale model was used to help plant operating personnel visualize an expansion program involving eleven major moves. Complete exhibit, of which photograph was a part, included sequence of moves, details of each item in expansion program, outside contractor's hook-up charges, maintenance department's own hook-up and installation charges





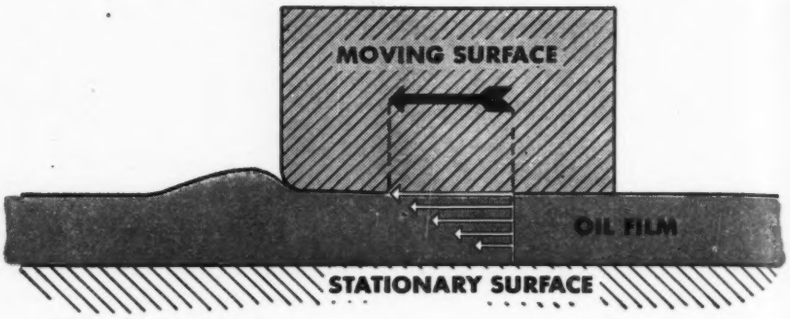
Plant Operation Library No. 99



LUBRICATION

- What Lubrication Is
- How Oil Lubricants Are Applied
- How Greases Are Applied
- How Oils Are Purified
- Handling and Storage

"PERFECT FILM" LUBRICATION



WHAT LUBRICATION IS

The force that tends to retard the relative motion of two surfaces in contact with one another is called friction. Lubrication is the means by which that force can be partially overcome.

What a lubricant actually does is to separate the two surfaces by interposing a fluid film between them. Any fluid is a lubricating agent to a greater or lesser degree; even air may be a satisfactory lubricant under some conditions. The problem is to find the particular lubricant best suited to a particular set of operating conditions. Oil, grease, graphite, animal fat, soap, tallow, and water are all lubricants. Some are best suited to one application; some to another. There are several hundred grades and combinations of these lubricants on the commercial market, plus several hundred more created by the inclusion of "special purpose" additives and inhibitors in the regular lubricants.

Oil Films The "ideal" lubricating condition is known as "perfect film lubrication"—complete separation of the surfaces normally in contact. Theoretically, under this condition there is no wear, provided, of course, that the lubricant contains no abrasive material. However, this absence of wear does not mean that there is no friction. What actually happens is this: The "film" of lubricant is made up of many "layers," each one a single molecule thick. The layer closest to the stationary surface (see above) clings to this surface and does not move. The layer closest to the moving surface clings to that surface, and moves at exactly the same speed as the surface itself. The intermediate layers are dragged along by the internal friction of the fluid. This internal friction is not the same for all fluids, and its quantitative measure is called viscosity.

Low viscosity is associated with "light" oils; high viscosity with "heavy" oils. Everyone who has ever handled oils knows that a light oil flows more freely than a heavy one—there is less internal friction to retard the flow. Likewise, a warm oil flows more freely than a cold one of the same viscosity—evidence that viscosity decreases as the temperature increases. Friction produces heat; thus a heavy oil generates more heat than a light one, with a consequent lowering of viscosity. This, in turn, reduces the frictional power loss until finally an equilibrium is established where temperature, viscosity, and power loss remain constant.

Progressive Waste From this it might appear that the ideal lubricating procedure would be to apply the heaviest grade of oil possible, and then wait for this equilibrium to establish itself. Such is not the case. First, this process is wasteful. In most cases, it would call for more pounds of lubricant at a greater cost per pound than using the correct lubricant initially. Second, there is an unnecessary power loss during this process. Third, this "changed" oil may not be of as high or as uniform a quality as that required for the specific application. Fourth, and perhaps most important, during the initial stages this heavier oil—by its very nature—may not be able to enter and lubricate parts most in need of lubrication.

Even too light an oil will overcome these four faults, but in doing so will introduce others of equal or greater consequence. If the oil is too thin, it cannot keep the surfaces far enough apart to prevent "high spots" from coming into contact. The result is not only a power loss through unnecessary friction, but also the "high spots" on the bearing and journal break off, contaminating the oil and producing excessive bearing wear. And the process is progressive. The increased friction creates additional heat, which

lowers the viscosity until the oil is virtually squeezed out from between the contact surfaces, and lubrication ceases entirely, resulting in severe operating conditions and breakdowns.

All too often there is a confusion of such terms as "lightness," "heaviness," "film strength," "wetting characteristics," and "oiliness." The latter is an ambiguous term at best; there is little agreement even among experts as to its exact meaning. Probably its most common usage is as a synonym for "adhesive quality" or "wetness." This, in turn, is the characteristic of an oil which adheres to the journal and bearing surfaces and resists being squeezed out under high pressures. "Film strength," as the name implies, is resistance to actual rupture of the oil film which exists under the so-called "ideal" lubricating conditions described earlier.

Greases Closely related to oils as industrial lubricants are greases. Actually, greases are simply metallic soaps in combination with a mineral oil. In principle, lubrication by grease differs little from oil. As the grease becomes warm, the oil is freed from the soap; grease, then, is merely another method of bringing oil to a bearing.

Characteristics—and therefore possible applications—of greases vary widely, depending not only on consistency or penetration, but also on the nature of the soap in them. Thus a soda-base grease cannot be used where water is present; a lime-base grease can. But because of its chemical nature, lime grease cannot be used in applications where the temperature approaches 212 deg. F. There are similar limitations to the other common-base greases: aluminum stearate, barium, lithium, tallow, graphite, and zinc stearate.

Although the number of greases available makes it possible to select one well-suited to almost any application, there are three conditions under which grease is especially useful:

1. Where the dripping of oil from a bearing is undesirable. Except when prescribed pressures are exceeded, there is practically no leakage from a grease-packed bearing.

2. Where large amounts of foreign matter are present in the air. Grease has a tendency to prevent the entrance of dirt, dust, and grit into the bearing.

3. Where extreme moisture conditions are encountered. Certain greases can effect an almost watertight seal around a bearing.

The sometime limited range of applications of certain greases, however, dictates that their selection—perhaps even more than the selection of oils—should be in the hands of an expert.

From the foregoing it can be seen that the choice of a lubricant is more than a mere "hit-or-miss" proposition. Basically, there are three important steps in the selection of the proper lubricant *for a single application.* They are:

1. Study operating conditions.

2. Determine lubricant characteristics *exactly* suited to those operating conditions.

3. Select a lubricant that has *exactly* those characteristics.

However, if this were done *throughout the plant,* the number of lubricants used would be both unwieldy and uneconomical. Minor compromises must be made at many points. If those compromises are made under the direction of a trained lubricating engineer, satisfactory service will be maintained *at all points* and the over-all efficiency of the plant will be markedly increased.

HOW OIL LUBRICANTS ARE APPLIED

There are, in general, two methods of applying lubricants:

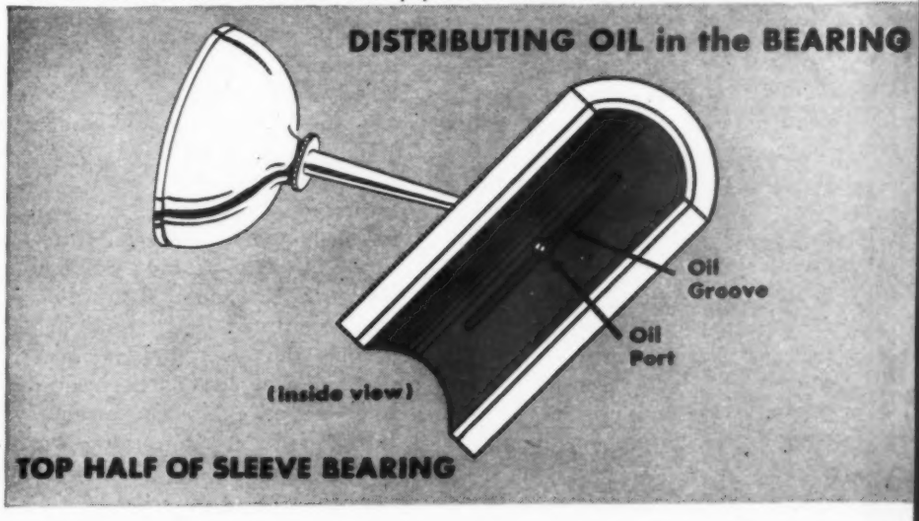
1. Forcing the lubricant between the surfaces under externally applied pressure.

2. Employing the "wedge" principle. If the leading edge of the moving surface is beveled—or round, as in a journal bearing—the lubricant is "piled up" ahead of the moving part. The pressure thus built up (see illustration on facing page) forces the lubricant between the surfaces, and prevents them from coming directly into physical contact with one another.

All the conventional means of lubricant application make use of one of these methods or a combination of them.

Hand Oiling Oldest, and perhaps still the commonest, method of applying oil is by hand. The familiar squirt can is used to supply oil through an oil-port to the bearing. Irregular timing of applications results in bearings nearly always being over- or under-lubricated,

Designs shown indicate *operating principle only*—there are many modifications of the devices illustrated which bear little physical resemblance to these "idealized" models



with consequent uneconomical operation. To minimize these effects, lubricants for this type of application should be of relatively high viscosity, or have good adhesive qualities, or both. Such oils have less tendency to leak, stay in the bearing longer, and, because of their adhesive quality, will form at least a partially effective oil film between applications. An effective system for insuring that lubrication schedules are followed is imperative when oil is applied in this manner.

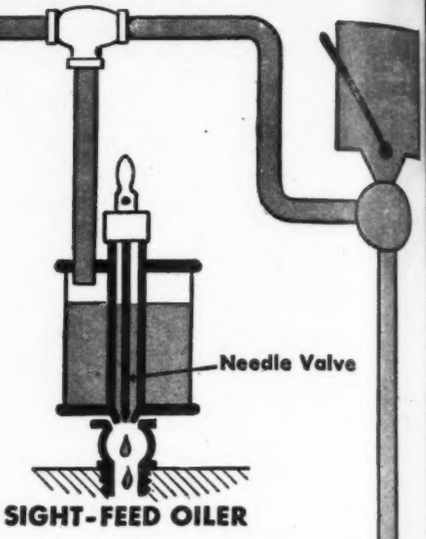
Drop-feed Oilers Drop-feed oilers are best suited to the continuous application of small quantities of relatively low-viscosity oil. A needle valve in a port on the bottom of a reservoir permits regulation of the rate at which drops of oil are formed and pass through the port to the bearing. The sight-feed oiler is a modification of the drop oiler, and gets its name from the fact that it has a glass insert in the feed tube which allows the rate of flow to be observed. Most drop-feed oilers of recent design have a shutoff valve which enables the operator to cut off the oil flow without changing the adjustment of the needle valve. Maintenance is minimized when a single large reservoir is used to supply an entire battery of individually adjustable oilers of this type. A master shutoff at the reservoir is also helpful with this type of set-up.

Wick Oilers *Siphon-wick oilers.* Most commonly used of the wick-feed oilers, they deliver a regulated flow of automatically filtered oil for light applications. The delivery tube (screwed into the oil port) extends above the oil level in the cup reservoir, and a wick of stranded cotton or wool leads from reservoir up over lip of delivery tube, and extends down into it. Capillary action carries oil to lip of tube, and length of wick in tube determines rate of flow according to the siphon principle. A crook-shaped wire holder can be used to remove wick and stop oil flow, as well as to insure positioning of wick or a stopcock can be provided as a shutoff. Oil level in the reservoir must be rigidly maintained because capillary action will not raise oil more than about two inches. Wide, shallow cups simplify this problem. Filtering action is automatic; abrasive matter cannot pass through the wick. However, if the oil is dirty, the wick must be changed frequently; foreign matter clogs in the wick and impedes the flow of lubricant.

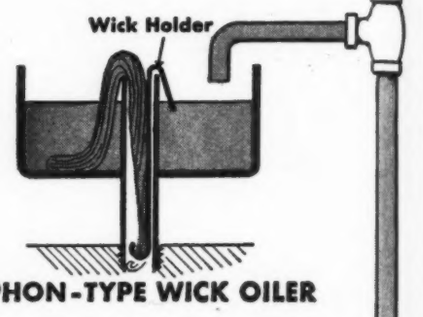
Bottom-feed wick oilers. For applications where maximum pressures occur at the top of the bearing, or where such pressures occurring at the bottom of the bearing are very low, the capillary action of the bottom-feed wick oiler provides a degree of automatic regulation in delivering oil to rotating journals. Wick rises from oil reservoir in bottom of housing, and is held against journal by a spring. Wick remains saturated at all times, but actual flow does not begin until journal starts rotating. This wipes oil off top of wick, and permits more to rise. Size and material of wick determine maximum flow; up to that point, flow rate is regulated by rate at which journal wipes oil off wick. Refilling is required infrequently because oil returns to the reservoir after draining from the bearing. Returning oil is likely to be dirty, however, so the wick must be watched for clogging.

Pad oilers. Pads or rollers of felt—and sometimes other materials—are useful for securing distribution of lubricants over fairly large bearing areas for certain classes of rough service. Rate of feed is not uniform and decreases rapidly from the maximum immediately after the pad has been saturated. Although there is no assurance of perfect uniformity, this drawback can be largely overcome by the use of sight-feed oilers as the primary supply for the felts.

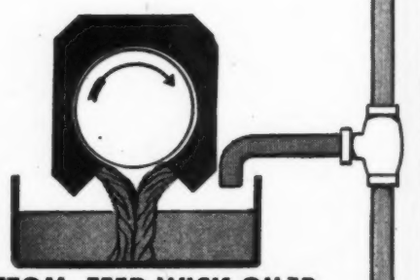
Bottom-feed waste oilers. Oil-saturated waste packed tightly under the journal delivers lubricant to the bearing. Packing waste in a semi-compartmented housing—as in the railroad car journal box—permits the reservoir principle to be employed, lessens the required frequency of replenishing oil supply. Intended for rough service, waste



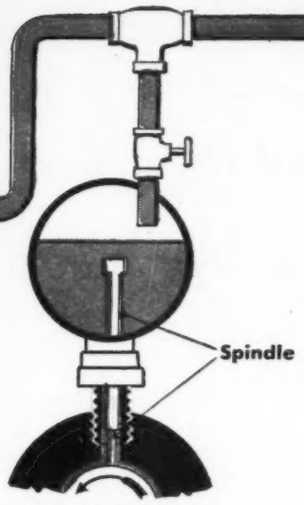
SIGHT-FEED OILER



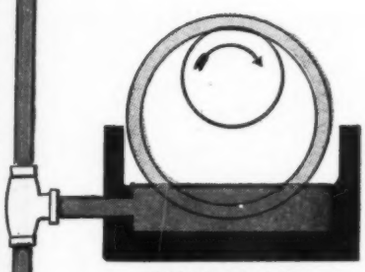
SIPHON-TYPE WICK OILER


BOTTOM-FEED WICK OILER

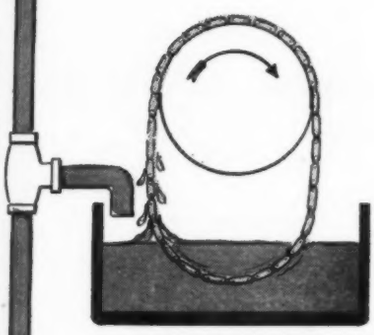
PAD OILER



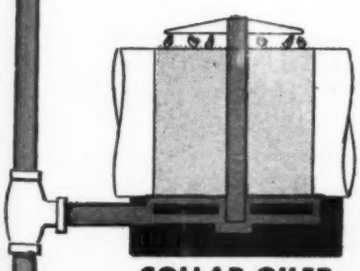
BOTTLE OILER



RING OILER



CHAIN OILER



COLLAR OILER

oilers will deliver a heavier oil than most other "wick" oilers. Sometimes overlooked in selection of heavy oil is the need for adhesive qualities in lubricants for this type of application; oil must cling to the journal with sufficient force to prevent its being wiped off by waste before reaching top of journal.

Bottle Oilers Applications of bottle oilers are limited to horizontal or nearly horizontal bearings in locations where the glass reservoirs are not exposed to danger of breakage. The inverted-bottle reservoir is fitted with an extension tube through which protrudes a soft steel or brass spindle. Lower end of spindle rests on journal and is free to move up or down with any movement or vibration of the journal. Vertical oscillation of spindle allows air to pass upward between spindle and tube; air displaces oil in reservoir, forces lubricant down to bearing. This arrangement permits oil flow only when journal is turning, and a degree of automatic regulation is provided by heat transfer through the spindle. As journal becomes warmer, rate of heat transfer through spindle is increased, warming the air in the reservoir and causing it to expand. This forces more lubricant to the bearing as it becomes warmer—the time when it needs additional oil. In most bottle oilers, this regulating process is neither rapid nor accurate, and should not be depended upon to supply exact lubricating needs. Because the basic rate of flow is determined by the clearance between spindle and bore of tube, and by the viscosity of the oil, extreme care must be exercised to insure that too heavy an oil is never placed in the reservoir. This problem is simplified, and entire process of refilling is speeded, if spare bottles are filled in the oil room and carried to the bearings in baskets or trays.

Ring Oilers As a group, ring, chain, and collar oilers are best suited for the delivery of oil to low- or medium-speed journals by lifting it from a reservoir at the bottom of an oil-tight housing. Applications are limited to horizontal bearings in which the load is supported on the bottom half. Because oil returns to the reservoir, an oilring bearing constitutes a type of self-contained, circulating lubrication system that requires little attention, especially when supplemented by an automatic constant-oil-level device. Depending on local conditions, these oilers should be drained and flushed about every 60 days. By placing cooling coils in, or circulating water around, the reservoir, these oilers lend themselves well to situations in which relatively high temperatures are likely to be encountered.

Ring oilers. Machined rings of 1½ to 2 times the diameter of the journal and riding freely on it will provide adequate lubrication for about 4 inches on either side of the ring, with the aid of oil grooves in the bearing. Oil in the reservoir must be maintained at such a level that from 20 to 30 degrees of the ring are immersed at all times. Ring oilers are not suited to low or extremely high speeds. Rings of laminar construction materially increase the rate at which oil is delivered, when this is desired for particular applications. Addition of an oil-catch cup and short delivery pipe makes the ring oiler especially useful for lubrication of silent-chain drives. Cup is so arranged that down-running side of ring passes through it; oil not released to journal is wiped off. Delivery pipe leading away from cup carries this oil directly to chain, completing lubrication of entire installation.

Chain oilers. For large, slow-speed bearings, an endless link chain is often more satisfactory than a ring. The chain has a greater carrying capacity and less tendency to slip when heavy-bodied oils are used. But chain oilers are not suitable for high speeds. The chain may be thrown against the housing and broken; and the churning of the oil causes foaming, increasing the tendency toward leakage and oxidation of the lubricant.

Collar oilers. A collar fastened to the journal (or made integral with it) dips into the reservoir and carries oil to the peak of its revolution, where it is wiped off and distributed along the bearing in oil

grooves. Such bearings are especially suited to low speeds and heavy-bodied oils. Various modifications of the cup-delivery tube used with the ring oiler can be employed to adapt collar oilers to silent-chain-drive applications

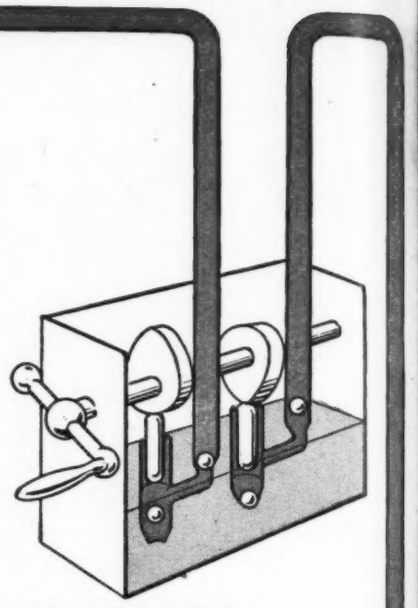
Bath Oiling Essentially similar to ring oiling, bath oiling operates by immersing some or all of the part to be lubricated in the reservoir. Applications include, but are not limited to, vertical shafts, silent-chain drives, worm gears, and thrust bearings. Variations of the oil level in the reservoir must be held within fairly narrow limits, making the use of automatic constant-oil-level devices desirable. High pressures and consequent high temperatures in some applications require cooling of the lubricant—a simple matter where the reservoir is not extremely limited in size.

Splash Oiling By utilizing the oil-tight housings as reservoirs, certain machinery can be lubricated by the splashing action of moving cranks, bearings, and gears. Parts themselves—or cups attached to them—direct a spray of oil into the bearings or into channels which carry it to the bearings. Oil level must be carefully maintained, and water—if it is possible for any to enter the system—must be removed regularly and frequently. Care must be exercised in setting the oil level to prevent excessive churning and splash. Churning increases tendency toward emulsibility and oxidation; because this cannot be entirely avoided, only oils with good demulsibility and heat-resisting characteristics should be used. Also useful in overcoming these features is the introduction of filters into the channels through which oil is gravity-fed to bearings after being splashed upward from the reservoir.

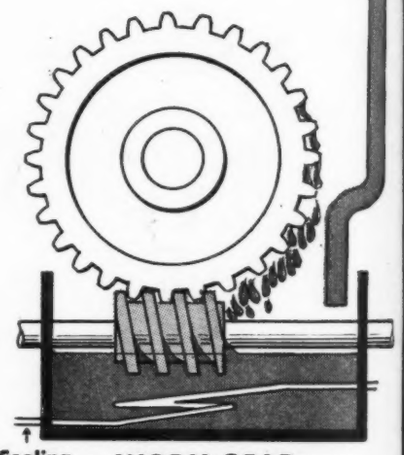
Force-feed Lubricators The many mechanical lubricators on the market are especially useful where bearings or other parts requiring lubrication are in inaccessible locations. Oil is pumped from a central reservoir, which may have a capacity of several gallons, through feed lines to the oil ports of the bearings. For applications where only intermittent charges of lubricant are required, models are available for hand operation; when oil is needed, the operator turns a handle, pulls a lever, or pushes a plunger to deliver the lubricant. Many lubricators, however, have one or more plunger pumps, driven by the machine being lubricated or by some other convenient source of power. When the machine-connected drive is used, lubricant is delivered only when the machine is running, and then in a volume directly proportional to the operating speed. While this may not be the "ideal" relationship, it insures a constant supply of lubricant which at least approximates requirements. Basic "rate of flow" adjustment is usually made by varying the pump stroke, although when the so-called dual- or parallel-line arrangement is employed, the adjustment is made in the feeder valves at the individual bearings. These valves are fully reversible, and are activated by applying pressure alternately to the two lines feeding it. Variable charge in the valve is discharged into the bearing at each reversal of pressure. Mechanical lubricators are frequently used to replenish the oil supply in drop- and sight-feed cups, wick oilers, and other devices operating on the reservoir principle.

Circulating Systems There are two essential features of any circulating system: (1) A continuous supply of oil being fed to the parts to be lubricated; and (2) repeated recovery and re-use of the lubricant. Because the oil is re-used, a necessary element of these systems is an arrangement whereby the lubricant is filtered, or at least strained, during each cycle. Dirt and other foreign matter collected during the lubricating process not only impair the quality of the oil if not filtered out, but may also result in clogging the oil line.

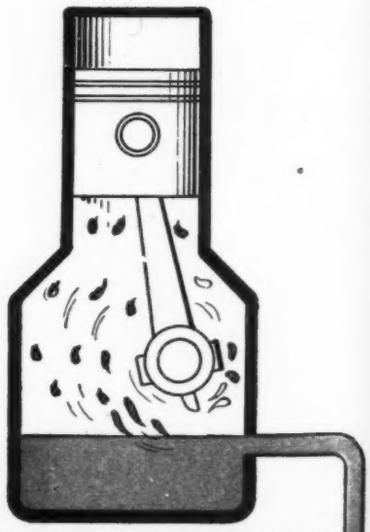
Gravity-circulation systems. Most of these systems employ two reser-



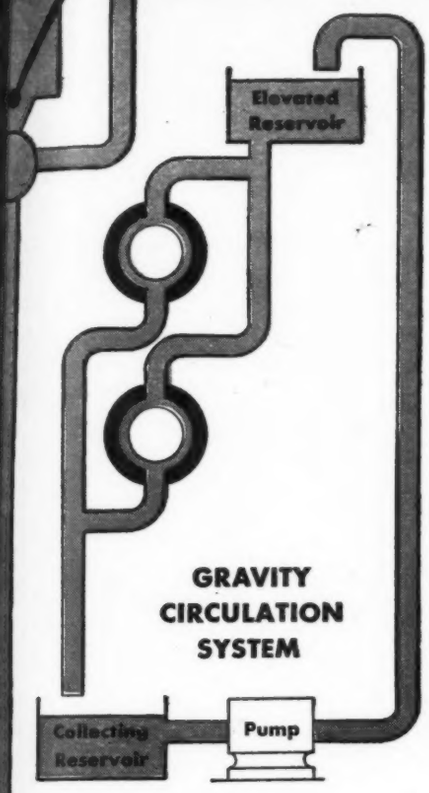
HAND OPERATED FORCE-FEED LUBRICATOR



WORM GEAR BATH OILER



SPLASH LUBRICATING SYSTEM

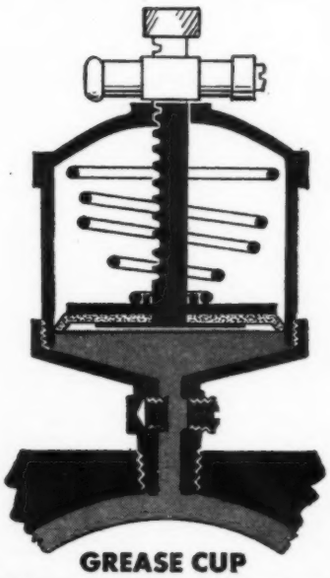


GRAVITY CIRCULATION SYSTEM

voirs—one above the highest point to be lubricated, the other below the lowest. Oil feeds by gravity from the higher reservoir to the bearings. Thus the oil pressure at the bearings is determined solely by the elevation of the reservoir. In practice, it seldom exceeds 5 pounds. From the bearings, the oil drains back to the lower reservoir or to a sump. Pumps return the oil, usually through filters, to the elevated reservoir. Because of the limited pressures involved, gravity-circulation systems are not suited to the use of heavy oils.

Pressure-circulation systems. Pumps, either independently driven or machine-connected, force oil to the bearings from which it drains back to the reservoir by gravity. Filters are normally in the single- or dual-feed lines; oil coolers are located in the return lines, to reduce the temperature of the lubricant as soon as possible after it leaves the bearings. Force-feed systems are especially useful for applications where a large volume of oil is needed to perform other than pure lubricating functions, as in high-speed, high-horsepower, silent-chain drives, where a stiff spray of oil cools the mechanism and flushes the chain of abrasive material. These systems are not as limited as gravity-feeds in the range of oils they will handle. Although installations for the delivery of heavy oils are not uncommon, pressure circulation is best suited to light oils, since they offer less resistance to pumping and flowing through the lines, and are more easily filtered and cooled than heavy oils. Pressure on the system is usually varied by adjusting a pressure-relief valve, although it may be accomplished by varying the speed of the pump, or by changing the size of the orifices through which the lubricant enters the bearings.

GREASE CUP SCREW-DOWN TYPE



GREASE CUP SPRING-COMPRESSION TYPE

HOW GREASES ARE APPLIED

In those applications where either grease or oil may be used, grease usually enjoys the advantage of requiring less attention. Oiling and greasing methods are essentially similar, but there are a few important differences.

Hand Greasing A paddle, swab, or brush is generally used for hand application of greases, although in some cases the grease is actually applied with the hand. Principal drawbacks—grease becomes contaminated; quantity cannot be carefully regulated, which usually results in overlubrication. This method is suitable only for open gears, chains, wire rope, and other rough classes of service.

Grease Cups *Hand operated.* A screw-down cap on the reservoir is used to force the lubricant through the port and into the bearing. A ball check valve, ratchet, or some similar device is frequently used to prevent back pressures. Regulation is difficult, and lubrication is provided only when the cap is turned down regularly and often.

Compression-spring operated. A spring-activated, leather-packed plunger forces grease to the bearing continuously, eliminating the need for constant operator attention. Primary regulation is provided by the relative stiffness of the spring used. Various other regulatory devices are used also, including a spring pressing against plunger shaft, and a transverse-bored feed regulating screw in the delivery tube.

Grease Wells A simple means of applying grease to bearings is the old-fashioned grease well. Difficulty of keeping the lubricant clean and lack of pressure limit the use of grease wells to certain classes of very rough service on bearings having open tops, sides, or bottoms. Relatively hard block greases are best suited to this type of application, with the blocks frequently being cut to fit the shape of the well.

Grease-packed Bearings

If bearings are totally enclosed, it is frequently practical to "pack" them with grease — usually introduced through a port that can be tightly plugged. Depending upon operating conditions, type of grease, type of bearing, and so forth, some grease-packed bearings require attention as infrequently as from once in two months to once in a year or even at longer intervals than that. Most commonly used with antifriction bearings—but when so used, care must be taken that the bearing is never packed more than one-third full.

Grease Guns

In many cases, it is desirable to deliver grease under pressure—(1) to force it into areas to be lubricated; (2) to force old grease and foreign matter out of the bearing; or (3) for a combination of these reasons. Various types of grease guns can produce up to 10,000 p.s.i. for use in such applications. Delivery is made through ports with special fittings, usually incorporating a ball check valve, which prevents the escape of the grease after the gun is removed from the fitting.

Simplest form of gun has a leather-packed plunger, activated by a screw-threaded shaft with a "T" or crank handle. It delivers pressures up to about 2000 p.s.i., and is well-suited to most general-purpose uses.

For higher pressures, the automatic hydraulic-plunger type is perhaps the most familiar. When pressure is applied, a sleeve slides back along fixed plunger, delivering a measured quantity of grease through a ball check valve in the nozzle. Spring action returns sleeve to the original position after each stroke. Amount of grease delivered can be varied by using sleeves of different lengths—interchangeable on many guns of this type. Leather-packed plunger in barrel of gun forces additional lubricant forward and into sleeve during stroke. Many of the newer guns of this type are operated pneumatically rather than by hand. Pressures up to 10,000 p.s.i. are available.

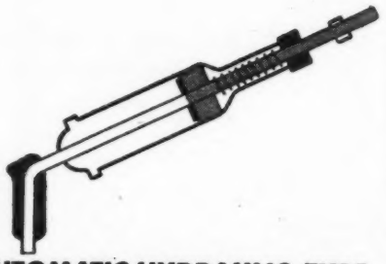
Second high-pressure type is the so-called gat gun. Grease from main chamber is forced past a ball check into a smaller, secondary chamber. Lever-operated plunger forces lubricant through discharge tube and into bearing. Depending on construction—and therefore on leverage provided—pressures range up to 10,000 p.s.i.

Centralized Greasing

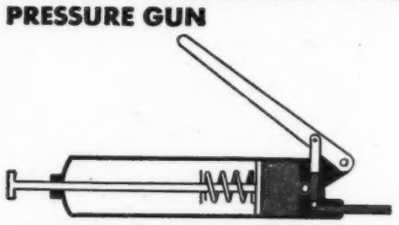
Basically, there are two types of centralized greasing systems — the so-called single-shot system and the continuous lubrication system. Neither of these systems provides for circulation of the lubricant—in the sense of re-use, as some oiling systems do —because grease is changed in form as it lubricates. Centralized systems are available for delivery of almost any type and quantity of grease under varying conditions, and, at a minimum, are time-savers, where the services of the maintenance crew are concerned. However, the situation in which they are most valuable is the greasing of machinery that requires lubrication frequently, but which for physical reasons cannot be greased manually while operating. The centralized system overcomes this handicap, and thereby makes sometimes important savings in downtime.

Single-shot. In only one respect does single-shot greasing differ from grease gun application of lubricant direct to the individual bearings—"leads" from many bearing ports are all brought to one central point. This makes it possible for the man servicing the machine, or even several machines, to do so without moving from a single position. In situations where machinery is crowded or where ports are relatively inaccessible, the time required for lubricating may be cut to a small fraction of normal. The possibility that the service man may overlook a "hidden" port, or intentionally neglect one that is awkward or dirty to reach, is materially reduced. The usual procedure is to have one outlet on the central "header" for each port to be lubricated; where lubricating requirements for more than

"T" HANDLE PRESSURE GUN

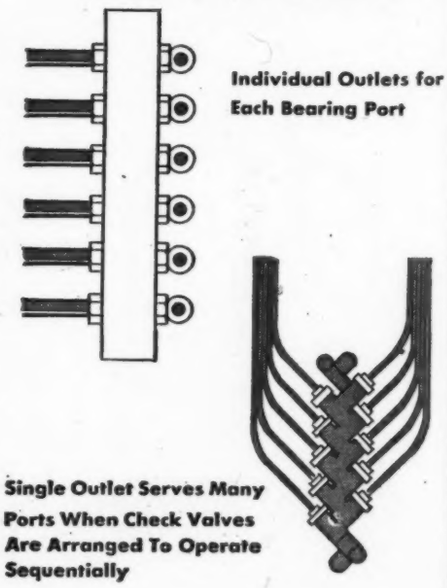


AUTOMATIC HYDRAULIC-TYPE PRESSURE GUN

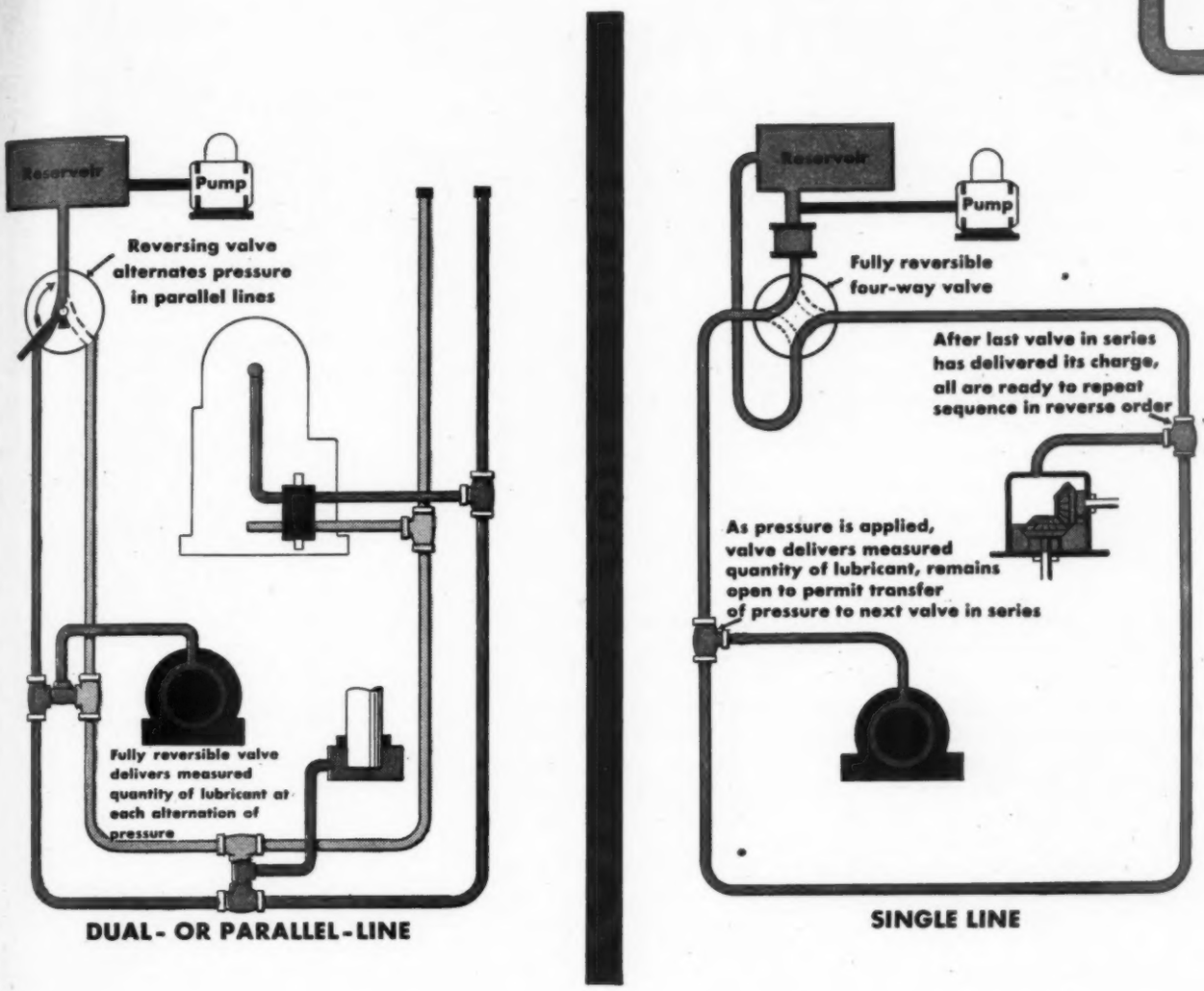


LEVER-TYPE PRESSURE GUN

MULTIPLE "HEADERS" FOR CENTRALIZED GREASING


Individual Outlets for Each Bearing Port
Single Outlet Serves Many Ports When Check Valves Are Arranged To Operate Sequentially

CENTRALIZED GREASING SYSTEMS


Reservoir
Pump
Reversing valve alternates pressure in parallel lines
Fully reversible valve delivers measured quantity of lubricant at each alternation of pressure
DUAL- OR PARALLEL-LINE
Reservoir
Pump
Fully reversible four-way valve
After last valve in series has delivered its charge, all are ready to repeat sequence in reverse order
As pressure is applied, valve delivers measured quantity of lubricant, remains open to permit transfer of pressure to next valve in series
SINGLE LINE

one bearing are identical, and where the pressures involved permit, it is frequently possible to have a single outlet serve more than one bearing.

Continuous. In actual practice, it is seldom necessary for grease to be forced into a bearing *at all times.* It is, however, frequently desirable to have small quantities forced in regularly and often. There are many centralized greasing systems available which will accomplish just this. Broadly, such systems may be classified as one of two types—single-line and dual-line. In either case, the amount of lubricant delivered per stroke is regulated by a feeder valve—usually adjustable—at or near the bearing. In all cases these valves are actuated by the pressure in the feeder line, pressure built up in a centrally located combination pump-reservoir unit, which may be manually, pneumatically, or electrically operated.

1. Single-line. For this type of feed, feeder valves for individual bearings are located "in series" along the single line leading from the pump-reservoir. As pressure is transmitted along the line, the first feeder valve is actuated, delivering a measured quantity of grease to the bearing. Valve is so arranged that, after charge is delivered, valve remains open to permit grease to be pumped to next bearing down the line. Feeder valves may be equipped with a spring mechanism that will return it to its original position, ready for the next charge, after deliveries have been made by all elements in the circuit. It is more common, however, to provide for reversible action of both feeder valves and pump. After the charge has been forced into each bearing, the pump is reversed, manually or automatically, through a four-way valve, and the new cycle is begun. Time lapse between reversals determines *total* amount of lubricant delivered during a given period.

2. Dual-line. Speed of delivery of successive charges may be increased by placing the feeder valves "in parallel" across dual feeder lines. Individual valves are reversible, activated by applying pressure alternately to the two main lines. Time lags due to "sequential" operation of single-line feed and build-up of reverse pressure are eliminated.

HOW OILS ARE PURIFIED

While care and cleanliness will improve the service delivered by a lubricant, oil that is re-used must be regularly and systematically cleansed of abrasives, water, and sludge. Two methods are commonly used for the purification of industrial lubricants — continuous and batch.

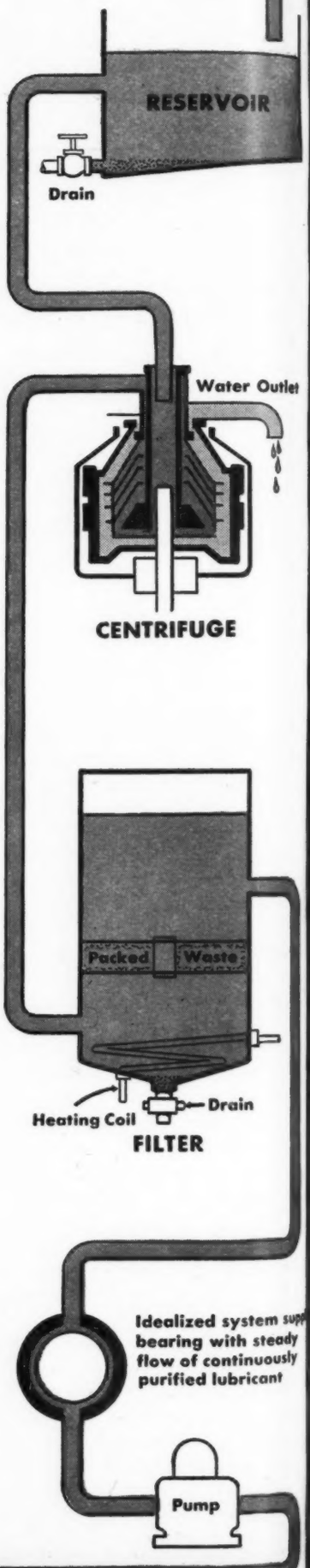
"Purifying" oils in the manner described below will not restore the oil to its original condition; it will extend its life and permit its continued use for the same or, in most cases, less exacting applications. Where the quantity of oil used is large, it is sometimes profitable to treat or re-refine the oil by chemical means in such a way that it will again meet the original specifications. Authorities differ as to the point at which reclamation (other terms: *restoration, reconditioning*) becomes feasible, but as a "rule of thumb," about 2500 gallons annually is frequently considered the minimum. Purification on the other hand is not limited to large volume users.

Continuous Purification Filters, centrifuges, or modified settling tanks may be used in circulating systems to remove many of the impurities from the lubricant without removing it from the system. There is one important limitation to continuous purification—impurities that are *in solution* in the oil are not removed. In order that circulation of the lubricant will not be impaired, filters are usually of a fairly coarse type—sometimes only strainers—or else the oil is forced through the filter under pressure. The pressure filter is especially useful where heavy-bodied oils are involved. Nature of impurities present and degree of purification desired dictate design of filter. Caution should be exercised in the selection of filters, particularly where "special purpose" lubricants are used. Certain additives and inhibitors are adversely affected by the materials used in some filters. In such applications selection should not be made without consulting a qualified lubricating engineer or an authoritative manual. One more caution—where elimination of water is important, *filters alone are not satisfactory.*

Centrifuges, on the other hand, remove most, if not all, of the water in the lubricant passing through them. By whirling the oil at high speed, matter with a higher specific gravity than oil—and this includes water—is thrown toward the outside of the centrifuge, where it can be drained off. There are many types of centrifuges, but, in general, *small* particles of abrasive matter, usually in suspension, sometimes in solution at normal circulating temperature (120-150 deg. F.) will not be removed. While most centrifuges are permanent installations to serve a specific centralized, circulating system, portable models are available to service several systems intermittently.

For applications in which only partial purification is required, the reservoir in a circulating system can usually be arranged to accomplish it. If oil is pumped into the reservoir at the top, and drawn off *above* the bottom, *some* of the water and larger impurities will settle to the bottom of the reservoir and will not be re-introduced into the system. A drain should be provided at the lowest point so that the sediment can be drawn off from time to time. Because of the constant agitation of the oil in the reservoir, and because of the relatively short time the oil remains there, purification is by no means complete.

Batch Purification Simplest and yet most complete method of purification is to place the used oil in settling tanks. Most tanks are of cylindrical construction, with a cone-shaped bottom. Oil should be drawn off through a tap located well above the bottom; the tip of the cone is arranged to permit the removal of water and sediment *after*



the clarified oil is drained off. Depending upon the type of oil and upon nature and quantity of the impurities to be removed, oil should remain in the settling tank from one or two weeks to as long as several months. Even some impurities normally classed as "soluble" will be removed during a lengthy settling process. For certain classes of impurities, this process can be speeded if steam is blown into the oil when it is first placed in the settling tank. There are a few simple rules to follow when settling tanks are being used for purification:

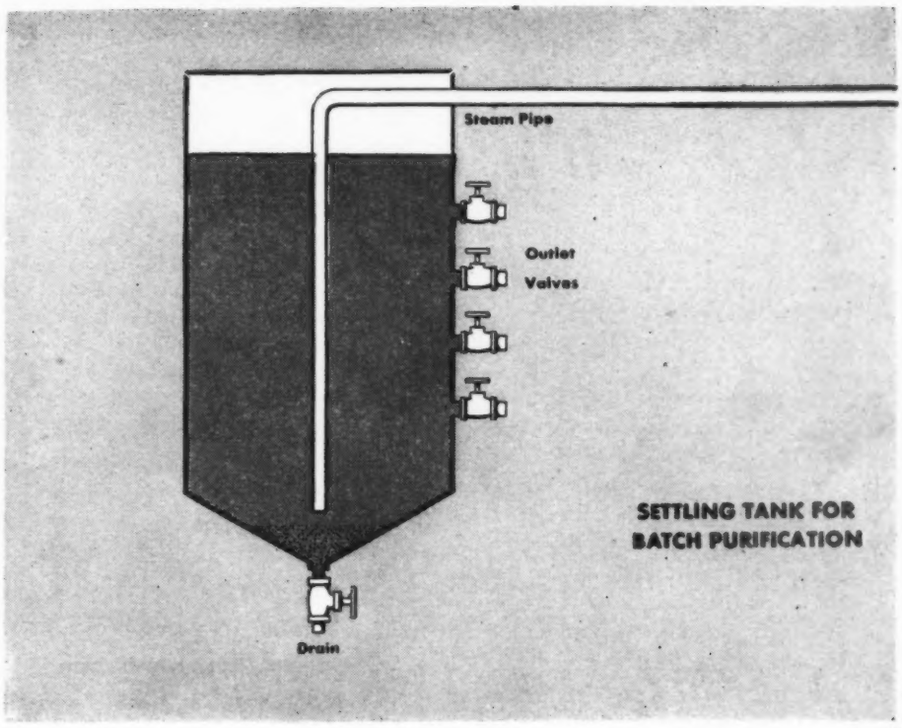
1. Keep tanks covered to prevent additional dirt and dust from reaching the oil, but do not seal the covers. The "breathing" of a "sealed" tank has a tendency to introduce water into the oil.

2. Maintain the tanks at constant temperature (70 to 100 deg. F.). This reduces condensation of the water in the air above the oil, and also holds constant the relative solubility of the impurities.

3. Do not agitate the oil in the settling tank *in any way*. Occasionally, it is necessary to withdraw some of the sediment during the settling process, and when this is the case, it should be done slowly and at a uniform rate.

4. If the oil being purified contains additives or inhibitors, or is intended for re-use in high-quality applications, submit samples of the clarified oil for laboratory analysis to insure that it still meets the required specifications.

5. Do not "mix" oils in the settling tanks, unless the final product is intended only for the very roughest classes of service. Keep the tank properly labeled to avoid confusion as to the type of oil it contains.



SETTLING TANK FOR BATCH PURIFICATION

Even oils from circulating systems equipped with filters or centrifuges should be "batch purified" from time to time because of the greater efficacy of this method of removing impurities. Where the quantity of oil used is small—as might be the case in a small plant or where there is a limited application for some types of oil—this process may be carried out in truly makeshift equipment, and still produce economically satisfactory results. A covered barrel or bucket serves as a settling tank, and the clarified oil is siphoned off. It is simply necessary to exercise care as to how deep the siphon is placed in the tank; three-quarters of the way down is usually safe.

Especially in plants where there are applications for fairly low-quality lubricants, it is worthwhile to catch, in buckets or sumps, the drip oil from bearings, gears, oil lines, and so forth, and purify it by this method. Drippings may appear to be a rather limited source of oil for purification, but even if the total collection is only one drop per second, on a long-term basis that amounts to a good deal more than 400 gallons a year.

HANDLING AND STORAGE

Basically, there are just five requisites to the proper handling and storage of lubricants. Most of them are simply matters of common sense; most of them are all too often neglected.

1. Store lubricants in a dry place and at a fairly constant temperature. A high percentage of even so-called "sealed" iron oil drums will "breathe" when subjected to changes in temperature. The changes in pressure within the drum that result from this process accelerate the condensation of the moisture in the air in the drum—thus speeding up the process still more. Take the extreme case — where water is standing on the drum head. What actually happens is this: As the temperature falls, the oil in the barrel contracts about 1 percent for each 20-deg. drop in temperature. This creates a partial vacuum in the tank, which "sucks" in the water standing on top. Best possible storage conditions—indoors, in dry air, at a temperature of between 70 and 100 deg. F.

2. Identify containers properly, so that at no time can there be any doubt as to the type, grade, and name of the lubricant in a particular

barrel, pump, bucket, or other container. Keeping drums out of the weather prevents identification from being worn off.

3. Measure lubricants as they are dispensed. The simplest way of doing this is with the aid of a bung pump. Some of these pumps have a calibrated revolution counter attached, so that the total quantity of oil dispensed is registered automatically. With others it is necessary to deliver the lubricant into a measuring container. A second type of pump is available for delivery direct from the drum—the entire head of the drum is removed, and a cover with pump built in is attached. When either of these types of pump is used, it is important that they be thoroughly cleaned before re-use on another drum containing a different grade of lubricant. The third type of dispenser is the cabinet with built-in pumps. Frequently, provision is made for several grades of oil or grease in a single, movable cabinet—this cuts down on trips to the storeroom to refill the oil can, grease gun, or other small-capacity carrying device.

4. Maintain records of quantity used. Storeroom records should show the quantity of oil dispensed for use in each department, or, if it is a large department, to each oiler working in that department. Monthly (sometimes weekly) comparisons of usage permit an immediate check if any sharp increase is noted. These checks usually take the form of keeping subsidiary records for each machine or other major oil-using unit. For circulating systems or installations with a known high lubricant-consumption rate, it is advisable to keep these subsidiary records as a matter of regular routine. Increased consumption is frequently the first sign that a machine is in need of repair, or that its lubricating system is out of adjustment. On the other hand, it may simply indicate overlubrication by the oiler, a wasteful procedure at best. Note, however, that overemphasis on the importance of the consumption rate may lead an oiler to *underlubricate*. Thus *any* marked change in the consumption rate—increase or decrease—should be investigated promptly.

5. *Keep lubricants clean.*

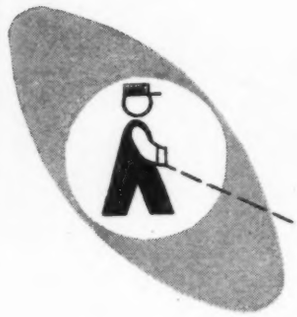
If a lubrication program is to be effective

SUPERVISION IS REQUIRED

In every plant, no matter how small or how large, final responsibility for the direction — and for the success — of the lubrication program should be in the hands of some *one* man. In a large organization, this man may be merely a coordinator, a staff executive. In a small plant, he may be a general foreman or a working foreman. But in any case, his must be the final responsibility. And in *every* case, it is management's job to see to it that he has the necessary authority to discharge his responsibilities.

The "supervisor of lubrication" — whatever his actual title — should know what his duties are. Usually, he should be responsible for supervision or execution of these things:

1. **Use *correct* lubricants in every case, and as few types as possible for the plant as a whole.**
2. **Apply lubricants *properly*.**
3. **Apply the correct *amount* of lubricant.**
4. **Apply lubricants at *proper intervals*.**
5. **Develop *schedules* of items 1-4 for each machine, distribute or post them, and see that they are followed.**
6. **Train and instruct the oilers; arrange for lubrication clinics if the number of oilers warrants — suppliers' sales and engineering representatives can frequently render valuable assistance in the preparation and execution of such programs.**
7. **Install and use lubricating devices correctly.**
8. **Keep lubricants clean, by keeping the oil room clean and by keeping lubricant containers covered.**
9. **Dispense lubricants through clean, properly identified equipment.**
10. **Practice preventive maintenance.**
11. **Cooperate with the maintenance and production departments on lubrication problems.**
12. **Collect used oils for purification, or for resale or reclamation, if quantity warrants.**
13. **Keep complete consumption records.**
14. **Record and analyze all lubrication-connected failures and breakdowns.**
15. **Eliminate all accident hazards connected with lubrication.**
16. **Keep abreast of new developments and practices in the lubricating field by periodic consultation with a qualified lubricating engineer — staff, consultant, or supplier's representative.**
17. **Minimize the total cost of lubrication, remembering that the *price* of an improper lubricant is a small fraction of its final *cost* in terms of poor service.**



Looking Ahead in Labor

last-minute round-up as we go to press . . .

Sudden lifting of price controls brought on the second round of union wage demands sooner than expected. The wage-price merry-go-round has started another ride. Where will it stop? What will it cost? Nobody knows.

Organized labor has two objectives. First, to keep wages in balance with the rising cost of living, if that is possible; preserve "real" wages. Second, to get insurance from management—or government—that will pay off if, and when, a bust comes.

Balance between wages and prices will be sought through cost-of-living raises or bonuses, particularly by the CIO. Labor prefers straight raises, higher wage rates. Bonuses are too easily canceled out when living costs drop. Wage rates can be held up longer.

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Insurance against lay-offs, or depression, is sought in various forms. This guaranteed annual wage tops the list.

Some unions, like the CIO United Auto Workers, also want pensions, employee retirement plans. Some will ask severance pay. The Chicago convention committed AFL leaders to drive for welfare funds. *John Lewis, back in "House of Labor," has shown the way.*

Government help is sought in achieving at least part of this last objective. The Latimer Committee's guaranteed wage study could give a helping hand on the annual wage. A higher minimum wage could insure against too drastic wage cuts for lower income groups. Proper charting by the President's Economic Advisory Council under the Employment Act could minimize lay-offs, if not prevent them.

These aren't all. *Organized labor has read the Supreme Court's decision against Mt. Clemens Pottery. This decision supported the principle of portal-to-portal pay for all industry. Consequently, employers may anticipate demands for pay from the time the clock is punched. Even beyond that, if considerable time is spent between gate and timeclock.* In suits for back pay, financial liability could, in some cases, run back to June, 1938, when Wage-Hour Act was enacted. Hoping to limit liability, the Gwynne Bill will be reintroduced in Congress.

AFL leaders take a different tack than CIO. They stress increased productivity, rather than cost-of-living, as a basis for wage increases. They visualize productivity rising, living costs dropping. AFL negotiators are told: "Watch output per man-hour." High profits in AFL-dominated industries where production has been steady—food products, paper, chemicals, trade, service—are compared by AFL with heavy losses in iron and steel, automobiles, and electrical equipment, where CIO pulled big strikes.

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Can unions withstand a repetition of last year's giant strikes? In the answer may be the clue to the strike outlook. But don't overlook stronger management resistance to increases because of uncertain market conditions as a factor. Nor reaction of workers to prospect of more payless pay days.

Most union leaders will think twice before calling strikes. Union treasuries have lost that wartime bulge. Even AFL, which struck less than CIO, reports a drop in treasury balance from $2,087,021 in 1945 to $1,742,077 as of Aug. 31—despite a membership increase from 6,931,221 to 7,151,808. UAW-CIO, losing $70,000 a month despite dues increase, had to drop 60 of its 393 organizers. The month-long steel strike cost steel workers $500,000.

Labor leaders must consider, also, that anti-strike legislation is certain to come up in new Congress. They are pessimistic, feel some law will pass. Perhaps not another Case bill. But something. Public utility disputes are of prime concern. Chances of amending Wagner Act are better. Thus organized labor is now on the defensive. Its political dominance is waning. Truman is no Roosevelt.

Into this situation steps Lewis the Aggressor. AFL looks to the miners' chieftain, first, to destroy the CIO; second, to restore AFL political power. Is any man better equipped in personal characteristics, experience, or economic power? Ask the government. Lewis's reward might be AFL presidency next year.

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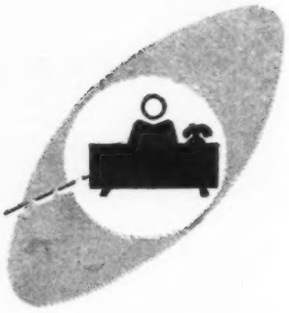
Resistance is building up against the southern drives of both AFL and CIO. Easy victories are over. Hard work begins. CIO textile workers report a "pattern of employer opposition" emerging. General wage increases throughout textiles discouraged AFL spending for present. *Strikes for union recognition can be expected (1) if too many NLRB elections are lost, or (2) if NLRB's heavy load delays elections to detriment of unions.*

Fewer jurisdictional disputes are in prospect for employers dealing with AFL metal trades unions. That's if machinery put on paper in Chicago works in practice. Disputes between these AFL unions are supposed to be decided, without strikes, by an umpire if agreement is not reached between unions involved. Similar procedure for all AFL unions has been rejected.

Looking Ahead in Business



last-minute round-up as we go to press . . .

Is business headed for a bump next year? A growing number of business analysts say that it is. They point to the many distortions in production and prices which, they say, can be corrected only by a business bump.

By a bump they mean a drop of 15 percent or so in industrial production, accompanied by some price declines and some unemployment. It wouldn't be a recession; it would be a readjustment.

There's no denying the fact that serious distortions in production and prices have developed. The $64 question is whether they can be straightened out without a business bump which, incidentally, might create more problems than it would solve.

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Industrial production can't rise much more. Non-durable goods production reached capacity early this year. Durable goods production rose from 191 (1935-1939 average=100) in April to 211 in September, where a practical ceiling has been reached. Reason for the ceiling is that output of basic materials, of which steel is the most important, cannot be pushed any higher.

Are there any signs of a business bump in the production picture? Unfortunately, there are a few. Most important is the fact that durable goods output flattened out at a lower level than manufacturers had planned.

If no way can be found to raise the ceiling on durable goods production, manufacturers may cut production goals. This would mean reduced orders for materials, parts, and equipment. It would also mean that inventories of many items would be too high so orders would be cut even more, while plants lived off stocks.

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There might even be large lay-offs as plants find that in shaking down operations to a lower-than-planned level they can get along with fewer workers. Employment in auto plants, for instance, may decline from current levels (20 percent above 1941) as manufacturers adjust their sights from 6 million cars and trucks to 4½ to 5 million.

What is equally important for the business outlook is that failure of output of autos, refrigerators, and other durables to reach planned levels may mean that there won't be enough durable goods on the market to take up the slack when consumer spending on non-durables begins to go back to normal.

The price outlook also supports those who are forecasting a business bump in 1947. The virtual collapse of price control has been followed by a sharp price rise. The cost of living, which stood at 129.9 (1935-39=100) in January rose to around 146 in September, and will almost certainly hit 150 before year's end. Zooming food prices account for most of the rise.

The outlook is for a reversal of these trends. Food prices should turn down next year as this year's bumper crops go to market and as foreign relief requirements slacken.

In contrast, manufactured goods prices will rise as OPA controls are lifted. Net result will be a decline in the cost of living next year of as much as 7 percent because food prices swing by far the greatest weight in the cost-of-living index.

Don't underestimate the seriousness of the upward trend of prices. Higher living costs make another round of wage demands inevitable; the fact that living costs may decline next year will, at most, only serve to moderate the final settlements.

What's more, it's hard to see how settlements can be reached without another wave of strikes which will tie up heavy industry and cut output of durable goods. This will accentuate the effects of a decline in spending on non-durable goods which might come early next year.

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Then there's the fact that, at some point, higher prices for autos, refrigerators, and other manufactured goods will call a halt to the sellers' market. Moreover, in any period of rising prices, pyschology plays a key role—once people think prices are getting too high they will stop buying and wait for prices to break. *This would be a real, though unorganized, buyers' strike.*

It's possible that these distortions can be worked out without a business bump. The tremendous pent-up demand for goods and services may make it possible to readjust the price structure without upsetting production and employment. It may be that ways can be found to step up output of steel and other materials, and so raise the ceiling on durable goods output.

It's still too early to say these things cannot be done. But the next few months should tell the tale—if the distortions begin to shake out, the boom will run on; if they get worse, business is in for a bump.

MOTOR RECORDS USED BY BOTH PRODUCTION AND MAINTENANCE

F. L. SMITH • MASTER MECHANIC, WHITLOCK CORDAGE COMPANY, JERSEY CITY, N. J.

No. 2 BUILDING

1st FLOOR

MOTORS No.	H.P.	Vts	Amp	R.P.M.	No. 1 SIZE MACH. No.	No.	No.	No.	REEL DRUM	REEL BAR	HOIST	REMARKS
2-1-1	40	220	100	900	W	X	Y	Z	2	3	....	Repaired 6/28/44
2-1-2	5	"	15.2	860	...	..	...	.	....	1	....	Repaired 2/3/42 emergency
2-1-3	2	"	6.6	..	..				.	....	1 Ton	
2-1-4	2	"	6.6	..	....	...	..	...	. .	....	1 "	Repaired 11/10/14
2-1-5	2	"	6.6	....	....	....	....	....	....	....	1 "	

2nd FLOOR

MOTORS No.	H.P.	Vts	Amp	R.P.M.	THREAD ROPE MAIN UNITS 6 Th'd.	12 Th'd.	24 Th'd.	32 Th'd.	SPARE UNITS 6 Th'd.	12 Th'd.	24 Th'd.	32 Th'd.	REEL BAR	REEL-OFF BAR	
2-2-1	50	20	125	720	12	5	7	2	....	....	...	...	9	2	Repaired 1/18/42
2-2-2	30	"	75	900	....	....	....	....	....	4	4	....	....	....	Repaired 12/28/44

3rd FLOOR

MOTORS No.	H.P.	Vts	Amp	R.P.M.	SPINDLES TWISTERS TOTAL	LAYERS TOTAL	BALLERS 1 lb.	5 lb.	10 lb.	UNIV'L-WIND'S 5 lb.	10 lb.	50 lb.	REEL BARS	NAILING MACH	
2-3-1	30	220	75	900	20	20	...	....	....	....	....	....	....	1	Repaired 8/23/42
2-3-2	50	440	625	720	22	34	....	....	....	....	....	....	....	....	Repaired 8/11/44
2-3-3	20	"	330	870	10	..	2	2	6	6	2	4	8		
															ELEVATOR No. 3
2-4-1	20	220	100	900	....	....	....	....	....	....	....	....	....	....	LOCATED ON ROOF

MOTORS & LOAD CONNECTIONS — No. 2 BUILDING 1st, 2nd & 3rd Floors

A loose-leaf motor record tells maintenance and operating executives at Whitlock Cordage all they need to know about the motors in their plant. And it is so arranged that this information can be picked off easily and quickly for the various purposes served.

Twelve letter-size black-on-white prints (one side, of course) constitute the entire record, which is held together in an ordinary index folder by brass clasps. Originating in the maintenance department, up-to-date copies of the record also are kept on the desks of all production superintendents.

Important to the simplicity of the set-up, maintenance, and use of this record is the system for identification of motors. All motors are assigned a composite code number which indicates by the first two digits the building and floor where the motor is situated. For instance, motor number 1-3-8 indicates motor number 8 on the third floor of building number 1. Likewise, motor number 7-2-3 is located on the second floor of building number 7.

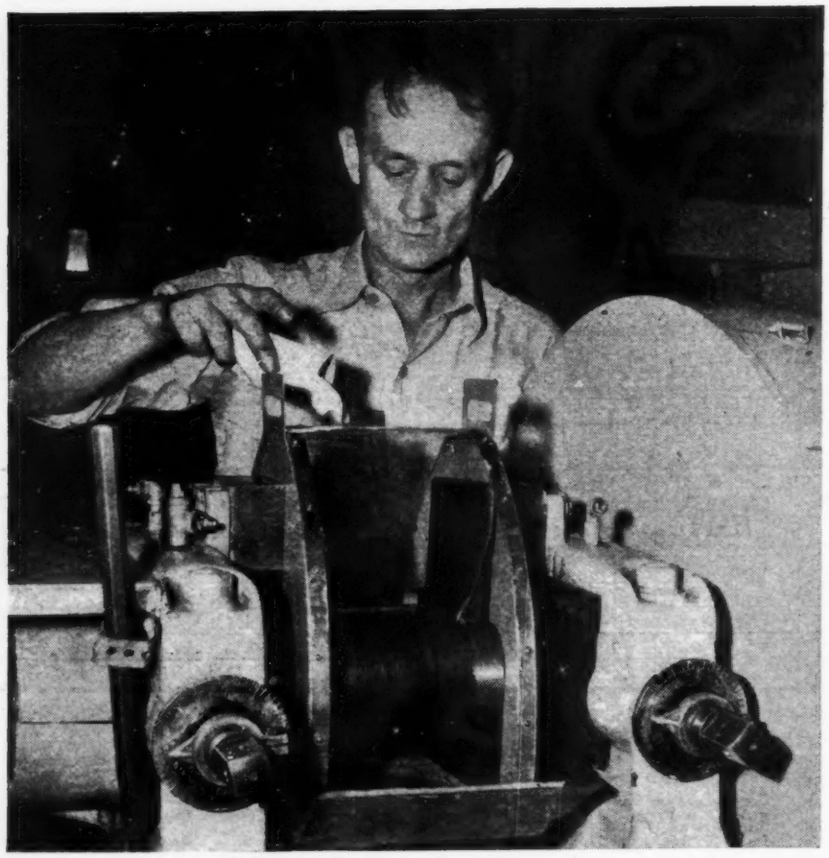
NUMBER ON FRAME

Each motor has this code number stenciled in white on its frame when it is installed. Should the motor be replaced, the new motor takes over that number. This eliminates the need for corrections to the record other than changes in rating or new equipment. Such incidents are infrequent at Whitlock, because group drives predominate and changes in layout are few. Furthermore, once assigned a number there is never any question as to where a motor which may be temporarily out of service belongs.

Here's how the motor record looks. Preceded by an index, the first page lists the motor rating and circuit connection of every motor in the plant. Circuit connection refers to number of main line connection to powerhouse, of which there are ten, numbered from 1 to 10. Beginning in a vertical column at the left, each motor is listed by its Whitlock code number, opposite which are columns indicating horsepower, amperes, and circuit number. Motors are listed in order according to groups, by buildings and floors, with sufficient paper space purposely left between each group for entering new equipment.

operating shorts

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for



A simple hood, transparent for easy visability, has been developed at The B. F. Goodrich Company, Akron, laboratories for a 4x7-in. mill, to prevent fluffy pigments from flying around the room, and to prevent loss of bits of rubber when extremely tough polymers are being milled. Side panels are made from 16-gage sheet metal, cut to fit around the mill guides and rolls. The center section, made from 1/16-in. transparent cellulose acetate, is built into one side and directed so that pigment drops into the bank. It rests on the mill guides, and clears the pan by about ¼ inch, so that pigment dropping into the pan can be collected on a sheet of paper and fed back into the batch through the spout without removing the hood

NITRIC ACID USED TO IDENTIFY METALS

HOWARD W. HILL, Assistant Department Superintendent, Dow Chemical Company, Pittsburg, Calif.

In our maintenance work we frequently had difficulty identifying pure nickel, monel, stainless steel, and polished steel in scrap, condenser tubes, and in valve and machinery parts. Monel, supposedly non-magnetic, was occasionally definitely magnetic, and when not, was difficult to tell from stainless steel. The method we now use has proved to be relatively foolproof for the four materials listed.

A small drop of concentrated nitric acid is placed on the clean metal. If no reaction occurs, the metal is either stainless steel or polished steel, and a magnet will determine which, stainless being usually non-magnetic.

If the metal is either nickel or monel, fumes of NO_2 will be given off, and a greenish solution results. A large drop of ammonia is then added to neutralize the acid. A deep blue flash, leaving a bluish stain around the edge of the liquid, indicates the copper content of monel. If no definite blue appears, the material is nickel.

For this purpose, two plainly labeled dropper bottles inserted in a block of wood are kept in places where such tests are frequently needed.

NOVEL "BAR" INCREASES HAND CREAM USE

A. M. GRIFFITH, Transformer and Generator Division, Westinghouse Electric Corporation, East Pittsburgh, Pa.

Getting workers to use hand creams that will prevent skin disorders has always been a problem. In this plant the safety department used to hand out the cream in small jars to the girls, but even then its use was neglected.

A far more effective method has recently been found—in the installation of "hand cream bars" just outside the washroom doors.

The "bars" consist of boards on which are mounted converted automobile grease guns, specially pur-

The "hand cream bar" placed just outside washroom doors encourages the use of hand creams, which help prevent skin disorders

DEPENDABLE POWER

AND IT'S STEADY, LASTING, ECONOMICAL POWER WHEN THE BATTERIES ARE EXIDE-IRONCLADS . . .

More and more, management executives are finding that Electric Industrial Trucks, powered by Exide-Ironclads, are the *right answer* to their materials handling problem. Numerous records prove that this efficient combination assures more tons per man per hour . . . and at lower cost, which means greater profits.

Exide-Ironclad Batteries deliver continuous service day in and day out for years. They have the *high power ability* required for frequent "stop and go" service . . . the *high maintained* voltage that constant lifting, hauling and stacking demands . . . and the *high capacity* needed to assure steady, day-long performance with full shift availability.

Write us for a FREE copy of Exide-Ironclad Topics which contains "Case Studies" of materials handling problems. It tells how to cut handling costs up to 50% . . . covers latest developments in handling materials from receiving to shipping.

Materials Handling offers one of the greatest opportunities for reducing costs and increasing profits, that are available to Management today.

ELECTRIC INDUSTRIAL TRUCKS POWERED BY EXIDE-IRONCLADS HAVE ALL THESE FEATURES . . .

Inherently dependable

Built for long, hard service

Provide maximum safety . . . best working conditions

Fast handling and accurate spotting

Effective use of lowest cost power

Lowest overall cost

HIGHEST EARNINGS
GREATEST SAVINGS

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

chased for this purpose, standard paper towel dispensers, and waste paper baskets. The guns dispense the thick cream neatly and economically, and any drippage is caught in paper dishes.

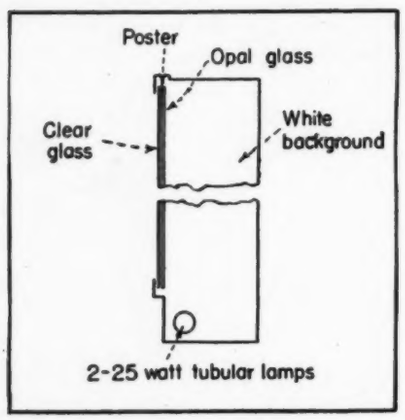
Instructions for use are printed on the towel dispensers, and cartoons calling attention to the beneficial results of using the cream are mounted in a frame on the board.

LIGHTED CUTOUTS FLASH SAFETY SLOGANS

RALPH MORIN, Boston Gear Works, Inc., North Quincy, Mass.

For some time we had felt that safety posters, even when mounted on an attractive bulletin board, were not striking enough to attract the attention of most employees.

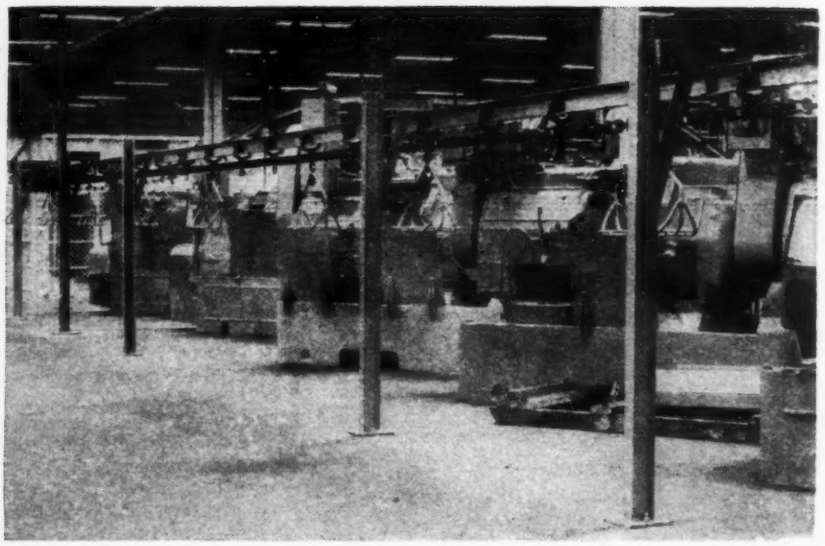
To stimulate interest in these slogans, special frames, 17x22 inches, the size of standard National Safety Council posters, were designed. Two panes of glass, clear on the outside and opal glass on the inside, allow the poster to be slid in between them. A 6-in. compartment, painted white, behind the



frame has 2 sockets in the bottom for 25-watt tubular lamps, to which a flasher is attached.

The key words and outline of the illustration which we want emphasized are cut out of the poster. For example, in a poster showing a man with safety goggles and the caption "The Eyes Have It," the words "Eyes" and "It" are cut out, and so are the safety goggles. The poster, being paper, allows some light to filter through, and of course the cutout sections stand out clearly.

Four of these frames have been installed, and we rotate the safety posters weekly. One new poster is put up each week in one frame, the others are placed in a new location. In this way, four safety slogans are posted, and each location has a new one posted in its lighted frame every week.



Floor supported low-level conveyor in the shock absorber production line removes strain on overheac structure. It also saves steel and many man-hours of labor

LOW-LEVEL CONVEYORS SAVE STEEL, LABOR

Considerable savings in steel as well as man-hours of labor have been made in the Allison Division, General Motors Corporation, Indianapolis, by the use of a low-level conveyor supported from the floor rather than hanging from overhead.

With the conveyor supports on the floor, it was not necessary, except for occasional braces, to run steel supports up to the overhead structure 15 feet above. The floor supports at most locations are approximately 5 feet high.

In addition to the savings accomplished with the low-level supports, their use spares the overhead steel structure from a heavy load.

FLUSHING OF FIRELINES PREVENTS CLOGGED NOZZLES

CHARLES HUEBNER, Maintenance Engineer, Sherwin-Williams Company, Cleveland

A study of failure of the fog firefighting installation that resulted in destruction of valuable property in this paint and varnish plant has resulted in a regular examination of the entire line twice weekly.

Despite the fact that the equipment consists of a 100,000-gal. tank, a pump large enough to maintain a pressure of 100 p.s.i.; and an 8-in. main extending the length of the plant, supplemented by two 6-in. city lines which, when joined to the 8-in. main, provides an 85-lb. pressure in the event of pump failure, examination showed that the failure was caused by a nozzle clogged with dirt and pieces of oakum. It was found also that the installation of the main in an underground duct was partially filled with dirt, while pieces of oakum and lead, used in joining the sections of pipe, had also seeped down into the line.

To correct this condition, the entire line was flushed out through all nozzle connections. Then each nozzle was tested to assure its being trouble free.

Now each nozzle is tested twice weekly, and, if clogging is discovered, the entire line is flushed immediately.

PLASTIC COATING PROTECTS SMALL FERROUS PARTS

CHARLES RAY CONSIDINE, San Diego, Calif.

A source of much annoyance and lost time in a firm whose business required the infrequent use of small steel dies was the damage that resulted from storing them when not in use.

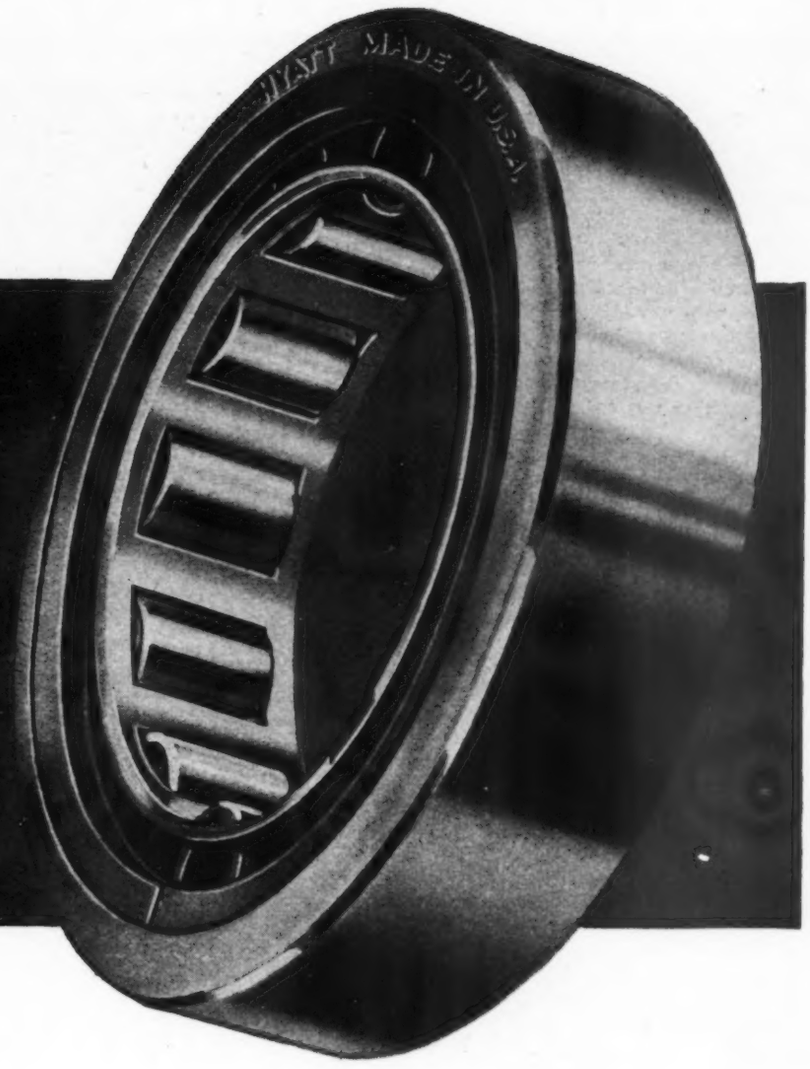
This firm, the Josten Manufacturing Company, Owatonna, Minn., specialized in the manufacture of class rings, each of which was especially made for the school to which they were sold. Some of these were made according to standard design, but most were individual designs, for which special dies had to be made. The result was more than 10,000 dies, varying from a 2½-in. cube to a 6x2½x2½-in. oblong.

These dies were made of expensive tool steel, requiring anywhere from 60 to 600 hours of die-cutting, die-sinking, and pantograph time in their manufacture. Since they were used only once or twice a year, most of the time they sat on the shelf, where they often rusted, picked up dust, were marred through careless handling, or were otherwise damaged.

After a good deal of experimentation, a transparent ethyl cellulose coating was found with which to coat these

Rollers Roll—

THROUGHOUT ALL INDUSTRY



From A to Z — automobiles to zippers. Wherever things are made, handled or transported, there you will find Hyatt Roller Bearings easing the turning of wheels and shafts.

And Hyatt Roller Bearings have for fifty-four years enabled machine designers, engineers and manufacturers to speed up production — cut maintenance costs and reduce friction to a minimum.

So many types of Hyatts are available that it can be stated with confidence — there is a Hyatt Bearing for every application. Consultation on your bearing problems does not obligate you. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT

dies. This is a simple process. A small portable dip kettle is filled with the melted plastic. A wax-impregnated string is looped around the die, and die and string are submerged in the ethyl cellulose. One dip is sufficient, and the coating cools and hardens so quickly that the die can be stacked away in the bin in less than 1 minute after dipping.

The process has proved successful for a number of reasons. First, the coating is impervious to dust, dirt, and rust. Second, the transparency of the plastic means that no marking of the die is necessary. Third, the elasticity of the material is such that the dies can be piled adjacent to and on top of one another without danger of scratching. Fourth, a lubricant contained in the substance leaves the die ready for immediate use when the coating is stripped off.

Finally, stripping the plastic from the die is a simple matter, accomplished merely by pressing against it with the fingers and stripping it much as one would pull the cellophane from a package of cigarettes. Only a thin coating, approximately $\frac{1}{16}$ inch thick, is needed, at an initial cost of about 1 cent for each die covered. Since the old coating stripped off when a die is to be put to use can be remelted and used again and again, the actual cost of using this material is difficult to compute.

GOOD RELATIONS BEGIN AT THE FRONT DESK

The visitor to Unitcast Corporation, Toledo, is handed a printed greeting and plant guide that reads:

WELCOME TO UNITCAST
Mr. .....

WE WANT YOU to know how genuinely pleased we are that you called, for we believe your visit will benefit our continual effort to improve.

Please make yourself comfortable until Mr. ..... can be notified. If you are not received promptly or informed there will be a slight delay, do not hesitate to ask the operator to announce you again.

Meanwhile, the following pages of this folder will furnish you with some interesting information about our Unitcast family or suggest to you another individual to contact while you are here.

Inside this Unitcast folder are pictures of the company's three plants, addresses and telephone numbers, a description of products made at the individual plants, lists of personnel and their titles, a "Memorandum Corner For Your Notes and Sketches," a map of Toledo with enlargements of plant locations.

This helpful folder effectively uses the "you" point of view to promote friendly relations.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
CHICAGO DISTRICT

INDUSTRIAL RELATIONS DEPARTMENT

SAFETY DIVISION

ACCIDENT-GRAM

TO ALL SUPERINTENDENTS:

On September 1, 1946, at 9:30 p.m., a hooker in one of the mills sustained an injury to his left thumb and index finger.

Injured and co-workmen were hooking up a lift of 5x5-in. billets approximately 14 to 15 feet in length. While injured was holding chain sling around his end of the lift one of the billets dislodged as chain tightened and rolled against chain catching his left thumb and index finger.

Doctor's Report

Fracture of the left thumb and left index finger. Disability estimated at 4 to 6 weeks.

Howard Holland
Supervisor of safety

9-3-46

"ACCIDENT-GRAM" SPIKES RUMORS, ACTS AS WARNING

The safety division of the Youngstown Sheet & Tube Company, Chicago district, has found a telegraph-type message, called Accident-Gram, to be useful both in spiking rumors about the seriousness of accidents in the plant and as a warning for supervisory personnel to check on conditions that might result in similar difficulty in their departments.

Every effort is made to distribute these notices the same day the accident occurs. In this way, correct information is in the hands of superintendents throughout the plant. Department heads can then give true details of each lost-time accident to foremen, who in turn pass the word along to workers. The notice tells when the accident happened, the occupation involved, and the nature of the injury. The second paragraph explains how it happened, and the concluding paragraph gives the doctor's report in a nutshell, reporting the extent of injury and the estimated period of disability.

With the complete story at hand, superintendents and foremen can check to make certain the conditions that resulted in the reported accident are not to be found in their own departments.

SPECIALLY BUILT TRUCKS DELIVER TOOLS AND MAIL

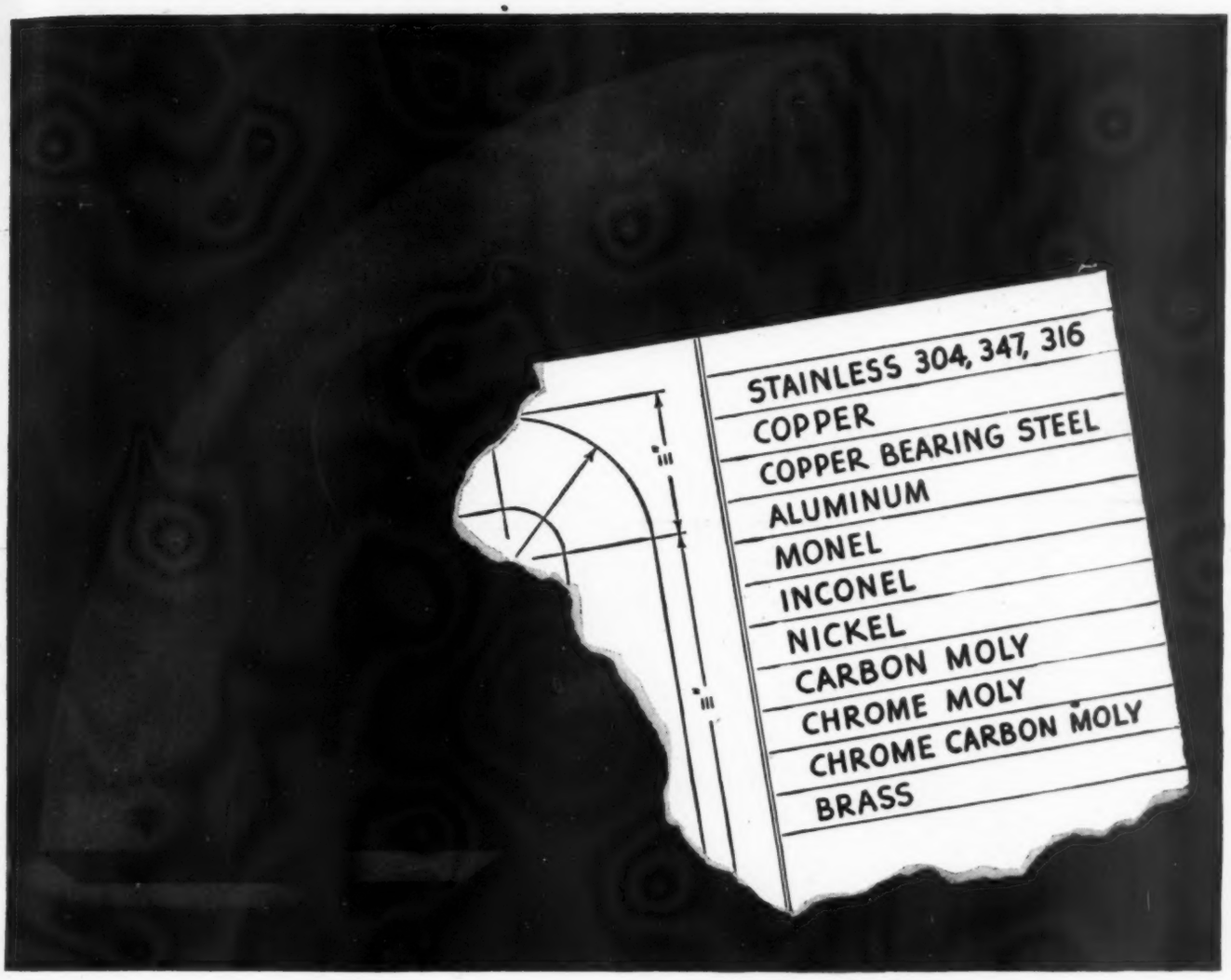
RALPH WOOD, Supervisor, Stock Control Division, National Cash Register Company, Dayton

Power trucks, with specially designed bodies comprised of drawers, each marked as to contents, are used to deliver mail, packages, and hand tools throughout the many buildings which make up the Dayton plant of The National Cash Register Company. The location of the hand-tool crib, adjacent to the parcel post transfer station,

Trucks arrive at transfer station on schedule, exchange interdepartmental mail, pick up new mail and other small items for delivery throughout the plant

permits delivery by these trucks of interdepartmental messages, mail, and all hand tools required to outfit new employees or to replace broken tools.

Trucks, which operate on a rigid schedule planned so that they all arrive at the transfer point simultaneously, also carry miscellaneous equipment needed throughout the plant, such as pencils, erasers, chamois skins, sponges, brushes, and bottles of ink.



Which Alloy?

TUBE-TURN quality-controlled Welding Fittings and Flanges are available in a wide range of metals and sizes to meet virtually every piping need. Practical production and application experience has dictated the engineered development of every fitting design. The selection of each alloy was made only after careful research and close cooperation with alert piping engineers all over the country whose daily problem is to cope with specific conditions of heat, pressure, flow and corrosive attack.

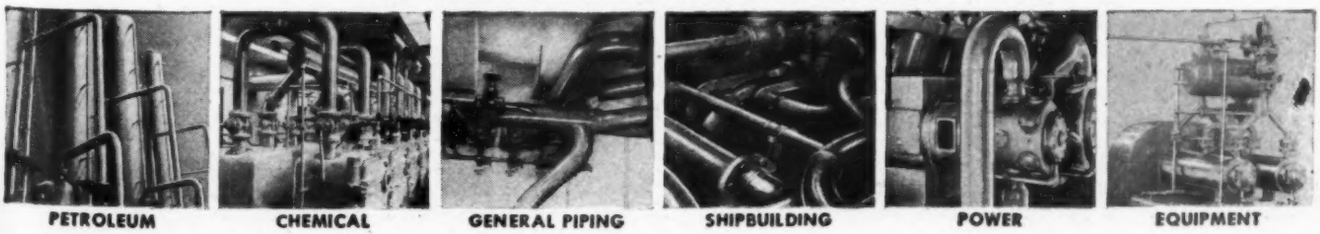
Not just another fitting . . . but one which meets, in every way, the rigid requirements of planned, long-lived systems . . . systems in which every component part plays an important role.

Tube-Turn engineers are ready to work with you and give you the benefit of their wide background of experience in the use and production of welding fittings in all these alloys. For piping permanence in alloy systems, be sure the Welding Fittings and Flanges are trade-marked Tube-Turn.

TUBE TURNS (Inc.) Louisville 1, Kentucky. District Offices: New York, Washington, D. C., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Houston San Francisco, Los Angeles.

TUBE-TURN TRADE MARK **tt** *Welding Fittings and Flanges*

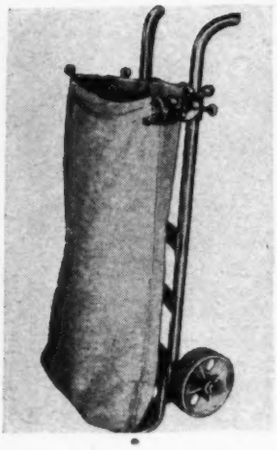
PIPING PERMANENCE SINCE 1927



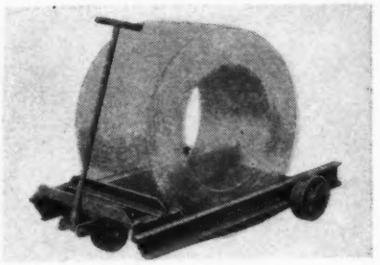
PETROLEUM | CHEMICAL | GENERAL PIPING | SHIPBUILDING | POWER | EQUIPMENT

materials handling III

Materials handling equipment, including hand and floor trucks, introduced to you during the past 12 months in the department, What's New in Equipment, are reviewed here to give you a quick one-year summary

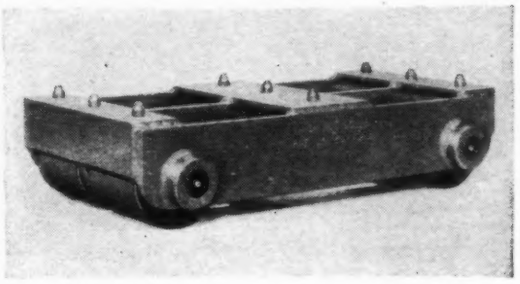


BAG-HOLDING TRUCK—Truck accommodates bags of any size. Height of spreader band can be set at any position from 18 to 40 inches. Bag is held in place by five malleable iron cam locks. Large gripping area of cam prevents tearing of bags, and there are no sharp points or edges to injure operator. Base is made of malleable iron casting, mounted on wheels, which are 6 or 8 inches in diameter. Chicago Manufacturing & Distributing Company, Chicago.

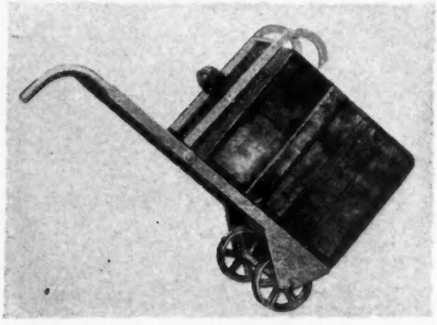


COIL STEEL TRUCK—When coil is rolled against rear or loading end of truck, the end settles down to take on the load, and then automatically straightens out again as load rolls on truck. One-inch dip in floor holds load in place. The all-welded truck has heavy channel side members. Palmer-Shile Company, Detroit.

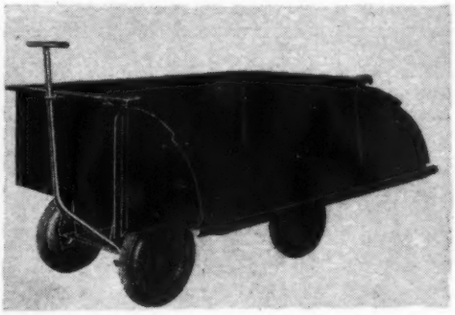
BOX TRUCK—Fiber box truck is claimed to be non-rusting and non-splintering, as well as highly maneuverable because of its treated rubber wheels. Suitable for stockrooms and factories, the truck features ribs reinforced with malleable iron corners, and a bottom of either high-grade plywood or lumber. Federal Fibre Corporation, Long Island City, N. Y.



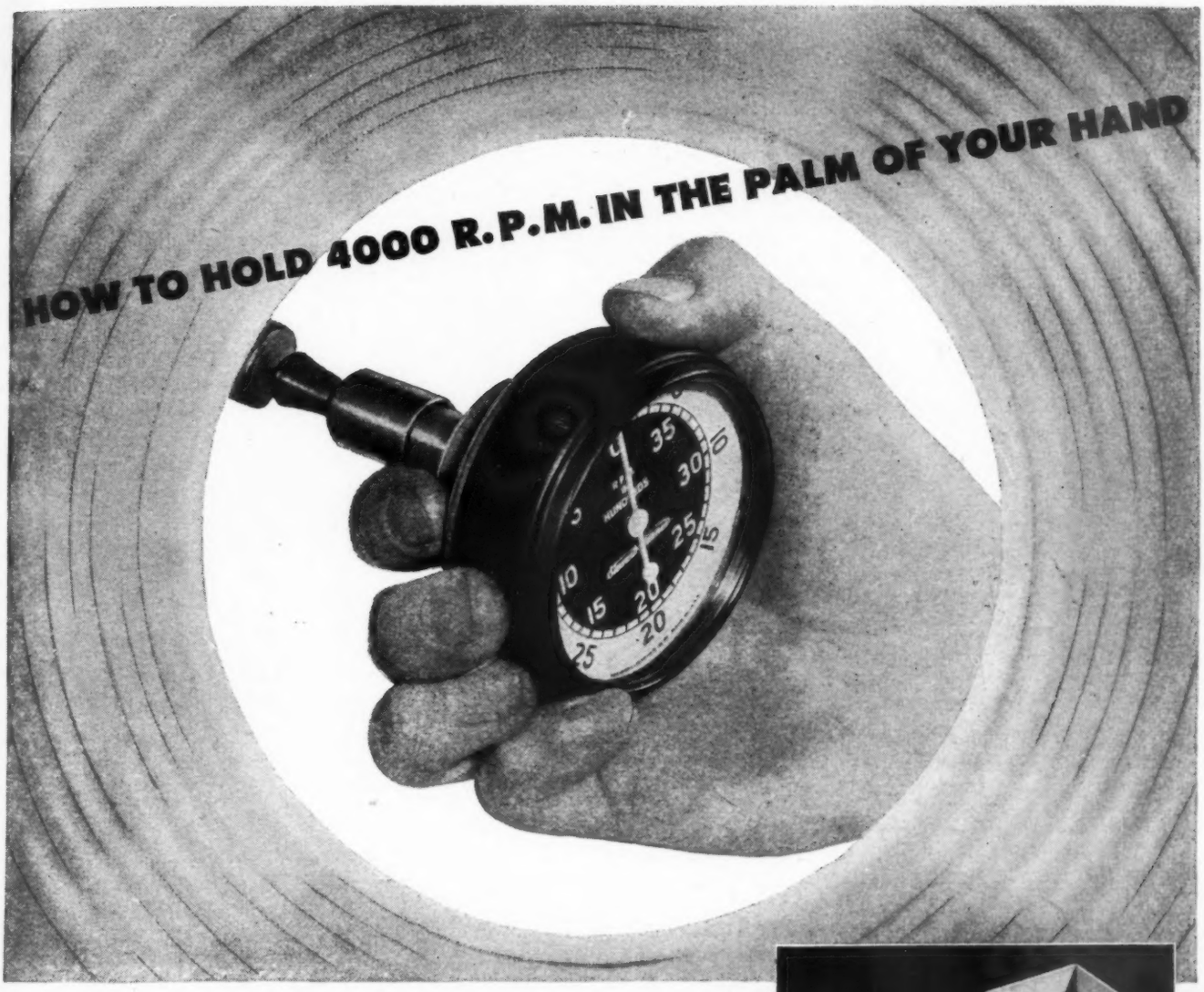
DOLLIES—Obtainable in pairs, Skid-Rol dollies can shift machines, tanks, boxes, and similar 10- to 12-ton loads. Steel cleats embedded in wood skids carry the load a few inches from floor. By manual power, load can be rolled over hard floors or pavements, and diagonally across railroad tracks. Each dolly is 18½x10½x4 inches, and is equipped with four all-steel rollers 3¾ inches in diameter. Techtmann Industries, Inc., Milwaukee.



CARBOY TRUCK—loads and handles carboys automatically. Gripping yoke and hardened steel studs on all-steel frame secure load. Truck is unloaded by tipping forward and releasing gripping yoke. Over-all width is 20 inches. Capacity is 500 pounds, and truck weighs 75 pounds. Palmer-Shile Company, Detroit.



DROP-SIDE CART—Load cart has drop side which may be locked in three positions. Hinges are designed to eliminate crevice between drop side and bottom of truck when it is fully open. Capacity is 1000 pounds. Comes with pneumatic, semi-steel, or cushion rubber wheels. Materials Handling Division, Market Forge Company, Everett, Mass.



Easy to Read Machine Speeds with the Little Stewart-Warner Portable Hand Tachometer

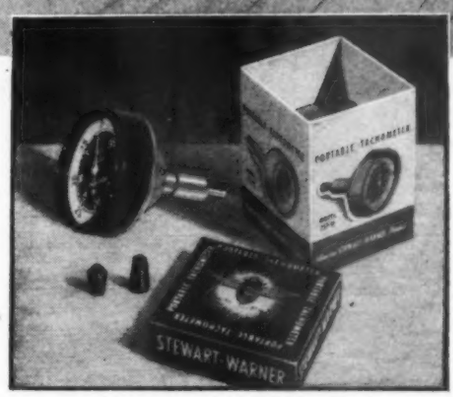
YES, it's small, actually hand-size, but it's rugged. In seconds, you can get an accurate reading on machine speeds, whether shafts or pulleys revolve clockwise or counter-clockwise.

This inexpensive, precision-built instrument is ideal for production engineers, maintenance superintendents, foremen, shop mechanics and service men.

The Stewart-Warner Portable Hand Tachometer enables you to be sure your machines are operating at top efficiency—a mighty important fact to know these days.

The complete unit comes ready to use—ready to help you read machine speeds from 100 to 4000 R.P.M.

Why not get several Stewart-Warner Hand Tachometers for your plant? Write for additional details today.

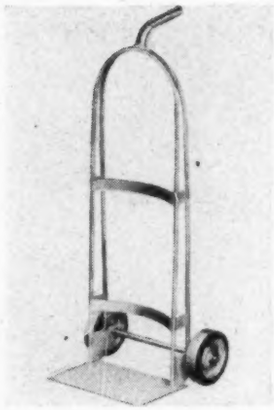


Stewart-Warner Portable Hand Tachometers come ready to use, packed in a carton that can be retained and used as a case for the instrument. Included are two tips—(No. 1) for shafts having a center hole—(No. 2) for measuring speed of flat shafts, pulleys, etc. Price only $10.45 each.

STEWART-WARNER
Industrial Tachometers

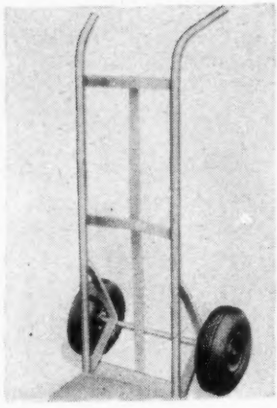
Stewart-Warner Corporation
1870 Diversey Parkway, Chicago 14, Illinois

HAND TRUCK—Zephyr hand truck of cast magnesium alloy weighs 26.6 pounds, has no points or edges, and automatically remains erect when unloaded. Wheels are cast magnesium, equipped with ball bearings, and Zerk lubricated. Rubber wheel-tread is molded on. Nose is made of rust-proof steel. All stress points are doubly reinforced for maximum strength, according to the manufacturer. Magnelux Manufacturing Company, Los Angeles.

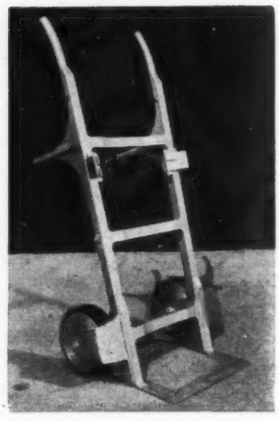


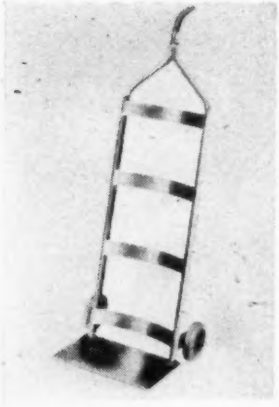
HAND TRUCK—One-hand operation and maneuverability in small areas are featured in truck which carries loads up to 500 pounds. Has a double tubular lightweight frame with welded joints and 8x13-in. high tensile steel bottom plate. Wheels are of copper-brazed double-disk pressed steel with floating steel ball lubrication. They have hard rubber treads permanently vulcanized to the rim. Yarco Distributors, Los Angeles.

HAND TRUCK—Featuring a solid nose that is said to facilitate handling cases, bags, and kegs, 500-lb. capacity hand truck has been added to the Wheel-Ezy line. A "General" pneumatic wheel has been adapted for use on the one-piece arc-welded frame, which manufacturer claims, permits heavy loads to be moved up and down steps and curbs safely and easily. All parts are plated. The Rapids-Standard Company, Inc., Grand Rapids, Mich.

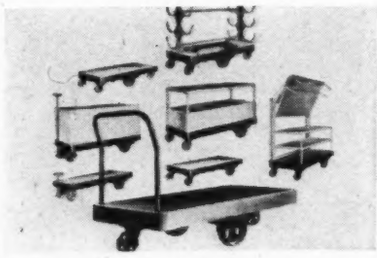


HAND TRUCKS—of aluminum alloy, with cast aluminum alloy wheels, are designed for high strength, corrosion resistance, and weldability. Large models have clips on side bars to secure load in place. There are no projecting bolts, axles, or other objects. Factory lubricated, the wheels require no further maintenance, and are made of a Firestone rubber compound, with Timken tapered roller bearings. Northrop Gaines, Inc., Los Angeles.



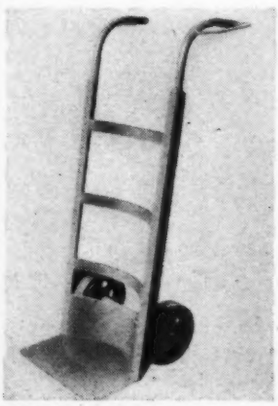


HAND TRUCK—of all-welded steel is adaptable for operation in narrow aisles. Large carrying platforms and slightly curved bands permit handling barrels, kegs, sacked materials, as well as boxes or crates. Has single handle, and balanced design places load on wheels instead of on trucker. Capacity is 500 pounds, with large overload safety factor. Truck has molded rubber tires. The Schmidgall Manufacturing Company, Peoria, Ill.

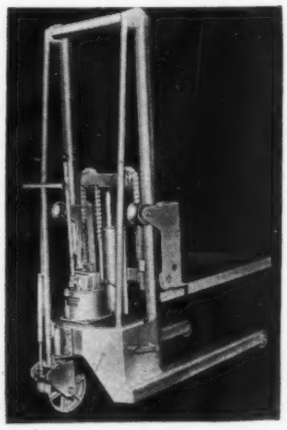


HAND TRUCKS AND ACCESSORIES — Attachments convert industrial truck into a box truck, leaf, shelf, rod and tube truck, or other combinations. Deep section channels formed in one piece with the deck provide steel chassis with capacity up to 5000 pounds. Market Forge Company, Everett, Mass.

HAND TRUCK—Knuckle guards on hand truck protect operator's hands against injury. Truck is provided with heavy nose plate extending 7 inches, and is adapted to heavy lifting in limited space. Made with angle-iron framework and crossbars welded on, truck is furnished with 8x2-in. roller bearing wheels. Supplied with metal or rubber-tired wheels in two models, 18x42 or 20x48 inches in diameter. Palmer-Shile Company, Detroit.



LIFT TRUCK—Employing lightweight welded tubular and formed plate construction, a 2000-lb. capacity hydraulic high-lift truck is suitable for transferring materials as well as for stacking and tiering. Standard model has 30x36-in. platform with elevating range from 6 to 60 inches. Has foot-operated floor lock. 2-speed hydraulic hand pump is standard, motor-driven hydraulic pump also available. Lyon-Raymond Corporation, Greene, N. Y.



How to SQUEEZE COSTS below the Price Tag

PRODUCE PARTS **RIGHT** THE FIRST TIME . . . RIGHT AT THE MACHINE . . . REDUCE SCRAP AND WASTED MAN AND MACHINE HOURS

Although this is a perfectly obvious statement, it is not applied anywhere near as often as it can be. You can't *inspect* passable dimensions into finished work. You have to *machine it into it while it is in production*. Inspection *after* the work is finished keeps unsatisfactory parts from getting into your product, but it *doesn't* keep man and machine hours and material from being wasted.

It seems rather foolish to wait until you have finished hundreds of parts before you determine how many are suitable and how many must be scrapped. The only, and very definite, solution is to furnish the machine operator with suitable gages which will tell him just how he is doing *before* he does it wrong. Go and no-go gages are not sufficient. They do not warn the operator *before* he, the tool or the machine produces wrong parts.

Indicating Gages, because they show *how much* the work dimension varies, show the *trend* of the work. They enable the workman to see how he is doing, to know when it is time to shut down his machine, sharpen the tool, adjust the machine or investigate any one of many conditions which may be causing the work to be machined unsatisfactorily.

Less Scrap, More Production, Better Quality

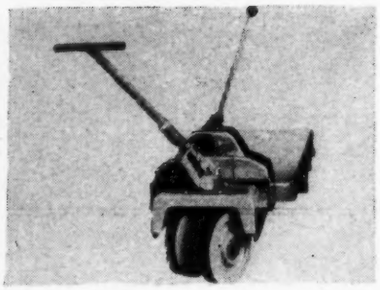
from Using this Gage on the Machine . . .

This grinding operation formerly produced 2.875 parts per hour. By substituting Federal-Arnold Grinding Gages for micrometers the job now produces 6.190 parts per hour—a bonus of *116%* for every machine and man hour. Moreover, overgrinding is practically eliminated—scrap is almost nil. The result: More production of better quality. That gives you an idea of the profits to be found in gaging at the machine.

Other keys to better quality and higher production per manhour are found in the Federal Dimensional Quality Control Primer. Write in for your copy of the Primer, or more information on Gages for controlling dimensional quality at the machine, to —

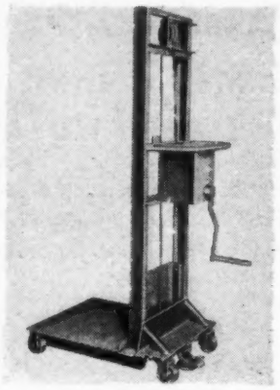
FEDERAL PRODUCTS CORPORATION
1144 Eddy Street **Providence 1, Rhode Island**

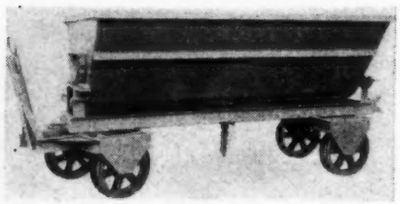
FEDERAL MECHANICAL AIR and ELECTRONIC GAGES
PRECISION MEASURING INSTRUMENTS



LIFT TRUCK—called Load-Lift, has capacity of 3000 or 5000 pounds. Ball bearings are sealed in the all-steel wheels. Platform remains stationary at any height. Small, accessible lever, which controls the speed, also lowers platform. Pulling handle is separate from lifting mechanism, and safety valve allows 20-percent overload. Market Forge Company, Everett, Mass.

SHOP LIFTER—Complete with floor lock, shop lifter can be used as a die table, lifter, and transporter of heavy fixtures, as well as for tiering boxes, raising toteboxes, draining drums, and positioning heavy work. Hand crank for raising platform is removable, and automatic clutch locks the load in any position. Platform has 500-lb. capacity. Service Caster & Truck Division, Domestic Industries, Inc., Somerville, Mass.

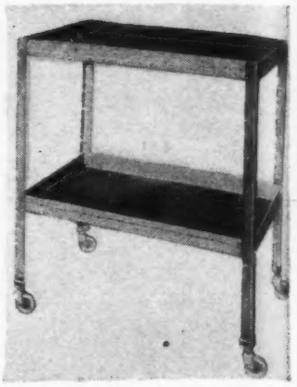


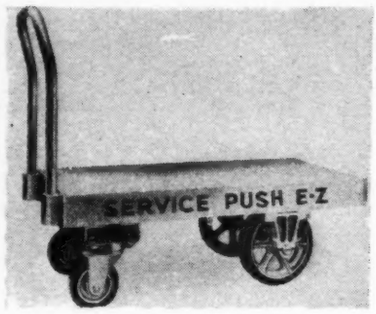


SIDE DUMP TRAILER—Dumping is controlled to either right or left side, in all-welded trailer. Gear type dumping rockers are said to provide smooth action. Automatic coupler at rear permits use of trailer in train hauling. Fifth wheel construction aids in making short turns. Pull bar is 30 inches long. Equipped with metal roller bearing wheels, with molded-on rubber tires. Palmer-Shile Company, Detroit.

STOCK CHECKER'S TRUCK—incorporates a writing table and stationary rack. Construction is all-steel welded, with 3 sheet-steel shelves, which have a 1-in. flange all around. Tubular handle is positioned to form protective bumper. Truck is fitted with four rubber-tired ball-bearing casters; two swivel at push-handle end, and the other two are rigid. Overall height to top shelf is 42½ inches. Palmer-Shile Company, Detroit.

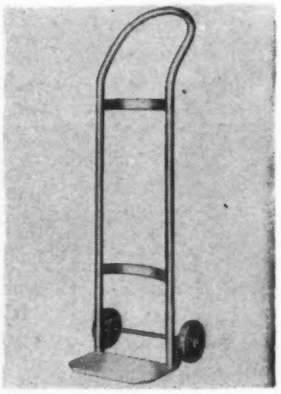
TOOL TRANSPORTER—made with heavy-gauge steel shelves and heavy angle iron legs, also can be used as parts and tool container, or work stand. Adaptable for carrying portable inspection equipment on assembly lines, or for stock pick-up and transportation. Available with or without casters; 30 inches high without casters, 33½ with; 18 inches wide, 30 long, finished in olive green baked enamel. Bay, Inc., Philadelphia.

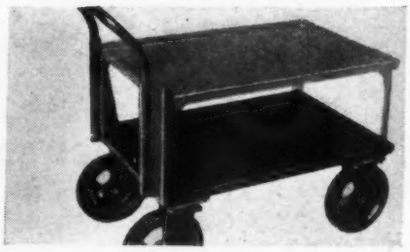




TRUCK — All-magnesium alloy truck, a Push-E-Z model, has capacity of 6000 pounds. Lightweight construction allows increased pay loads, easy operation, and less physical fatigue in materials handling, according to the manufacturer. Service Caster & Truck Division, Domestic Industries, Inc., Albion, Mich.

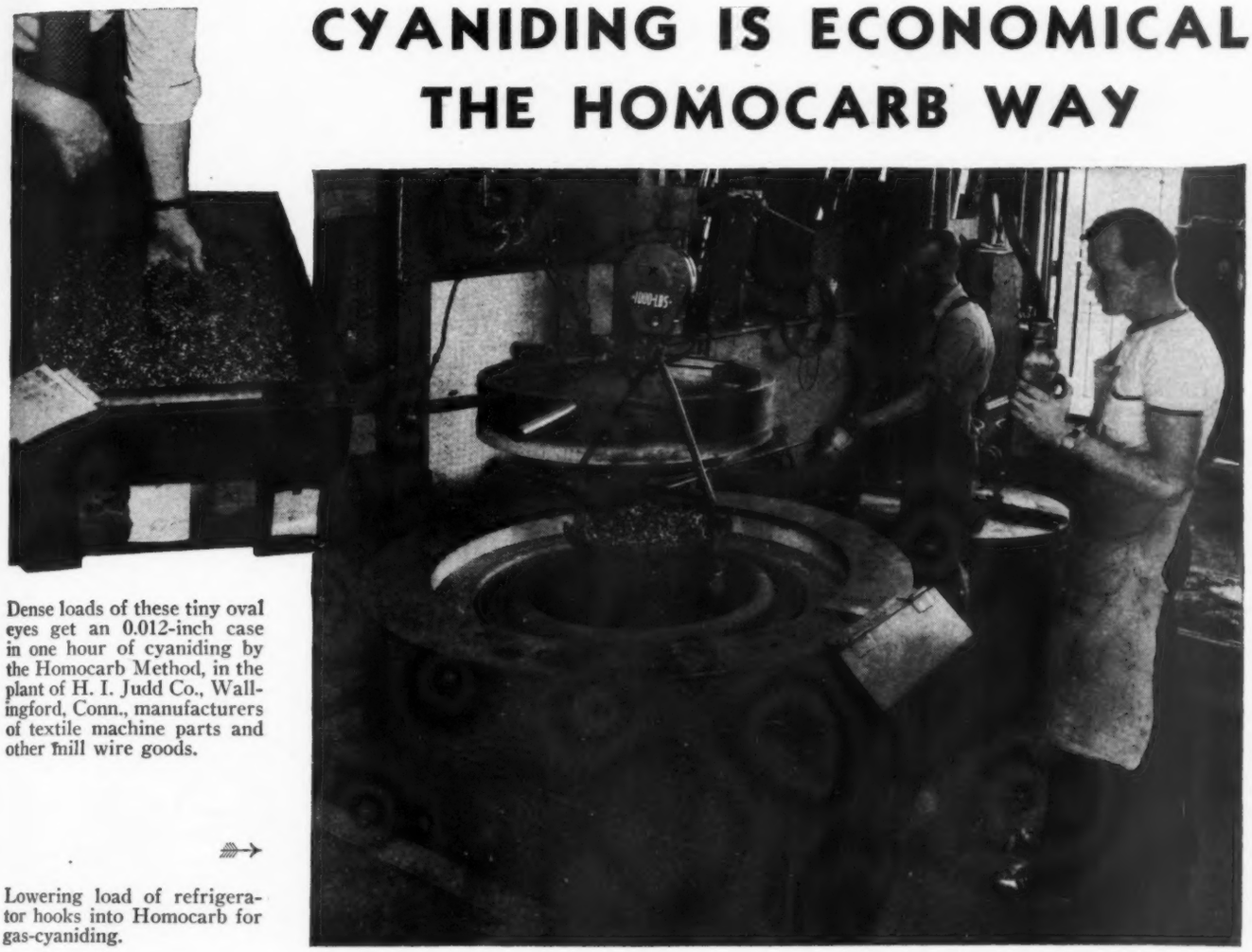
UTILITY TRUCK—Featuring all-welded tubular construction, rugged, lightweight portable utility truck handles gas cylinders, barrels, boxes, crates, and beverage cases of all sizes. Has curved handle for easy loading and pushing. Mechanical rubber tires are noiseless, with oilless bronze bearings and high grade hard steel axles. Capacity of truck is 300 pounds. Burdett Oxygen Company, Cleveland.





UTILITY TRUCK—All-purpose small utility truck designed for handling parts, equipment, and supplies, has a short wheelbase. Steel bed and platform of truck are seamless one-piece construction. All corners are rounded and edges reinforced. Truck can carry from one to four platforms. Drinkwater, Inc., Chicago.

CYANIDING IS ECONOMICAL THE HOMOCARB WAY



Dense loads of these tiny oval eyes get an 0.012-inch case in one hour of cyaniding by the Homocarb Method, in the plant of H. I. Judd Co., Wallingford, Conn., manufacturers of textile machine parts and other mill wire goods.

Lowering load of refrigerator hooks into Homocarb for gas-cyaniding.

Cyanided steel parts can have not only file-hardness but uniform hardness and reduced distortion when they are gas-cyanided in the Homocarb way. Several reasons explain these results:

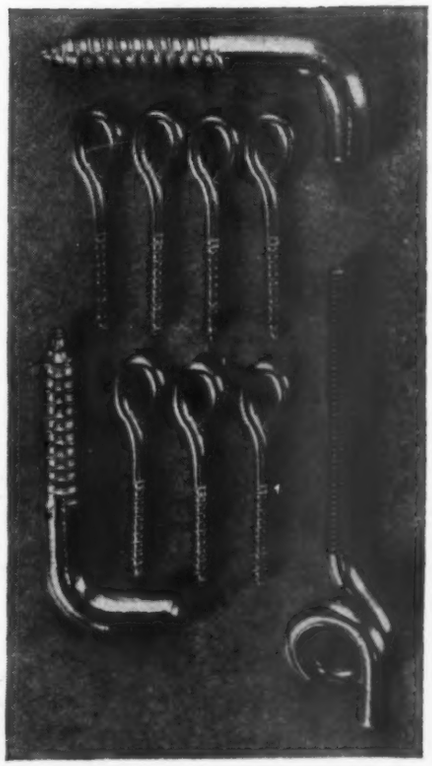
1. Gas cyaniding deposits no coating on parts, and work can therefore be quenched in either water or oil, acquiring file-hard case in either.

2. Fresh cyaniding gas is automatically fed to the Furnace in a continuous stream, and spent gas exhausts promptly from the Furnace. Cyaniding medium is thus always held at full strength.

3. This uniform medium acts on the work with great uniformity, because the entire internal design of the Furnace is planned for that one purpose. Gas follows the short, efficient Homo path from the fan, past the heaters and into work. Snug fitting prevents by-passing and ample power insures uniform penetration of dense loads. Results are constant and predictable.

4. Automatic control is by our newest, most economical method—Micromax D.A.T. It gives proportioning control by on-and-off contacts; normal voltage changes don't affect regulation. Rejects often vanish; are always insignificant.

If you have a specific problem, in cyaniding or carburizing, we suggest you write for Homocarb Catalog T-623, or a call from an L&N Field Engineer, as you prefer.



Judd Co. mill wire goods, actual size.

LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

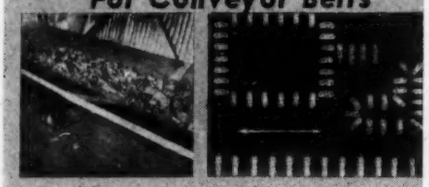
MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl. Ad T-623(23)

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

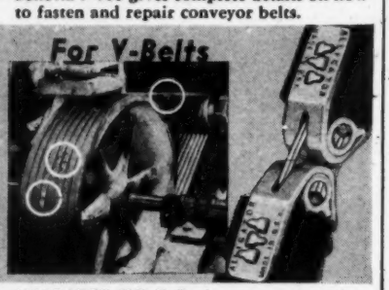
For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips and patches that can be made with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts



ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

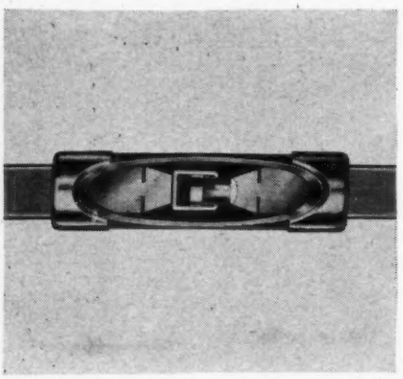
Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.

what's new in equipment

TWO-ELEMENT FUSE

Trion is a dual-element fuse which can be used at the same current rating as that of the motor or transformer it protects. It matches the heat-absorbing capacity of the motor or transformer, absorbing heat ampere for ampere. Has long safe time-delay, allowing a motor



to start on heavy safe overloads, but blows before any harmful overload occurs, whether the motor is starting or running. Also protects against single phasing on poly-phase motors, and against stalled rotor current in single-phase motors. Can be used with push-button-type motor switch at same current rating as thermal relay heater unit. Operates at 286 deg. F. The Chase-Shawmut Co., 40 Carroll St., Newburyport, Mass.

FORK LIFT TRUCK

Pneumatic tire 4000-lb. fork-type lift truck uses a Wisconsin air-cooled motor, a trunnion steering, and 7.00x12 tires. Similar in appearance to manufacturer's standard units, it is adapted for use over any type of indoor or outdoor road surfaces. Hyster Co., Danville, Ill.

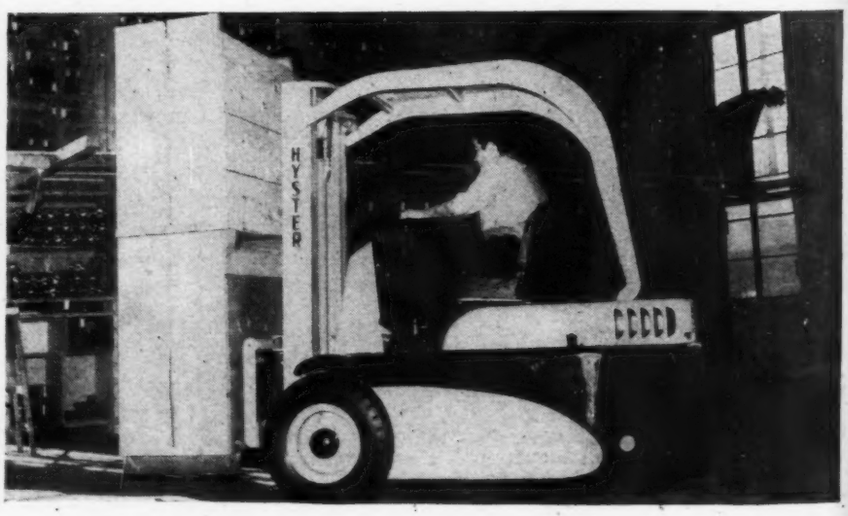
RUST ARRESTING PAINT

Rustrem industrial paint is said to seal rusty surfaces, stopping rust permanently. Can be applied directly over rust without cleaning or scraping. Wherever metal must be protected, whether submerged in water or exposed in moist or fume-laden atmosphere, the coating prevents further oxidation and provides a base for decorative paints. Speco, Inc., Cleveland.

FILING CABINETS

Line of filing cabinets is available in eleven models, with or without general locks, in suspension and non-suspen-

sion types. Made with rounded corners on drawers and crossrails; drawers rolling on 6 ball bearings and 2 floating

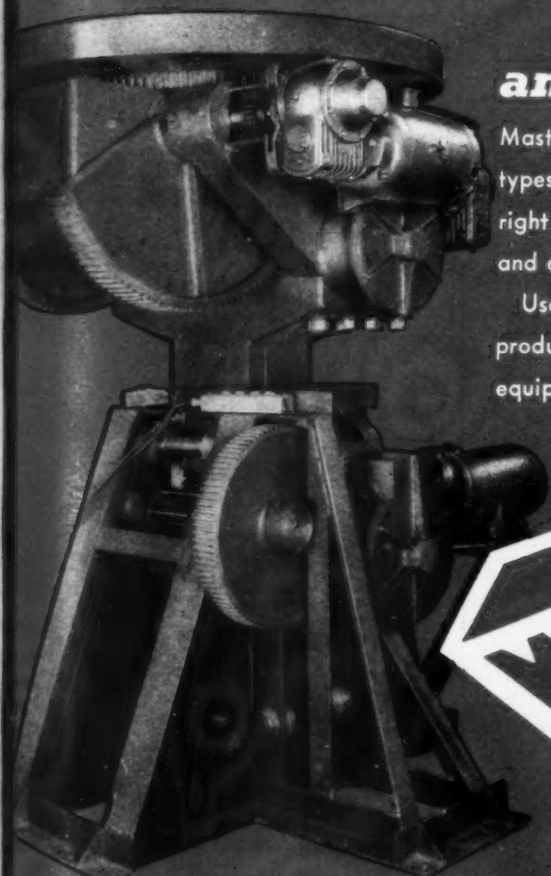


the RIGHT *horsepower*

Available in sizes from 1/10 to 100 horsepower.

the RIGHT *shaft speed*

Gear reduction ratios range up to 432 to 1.



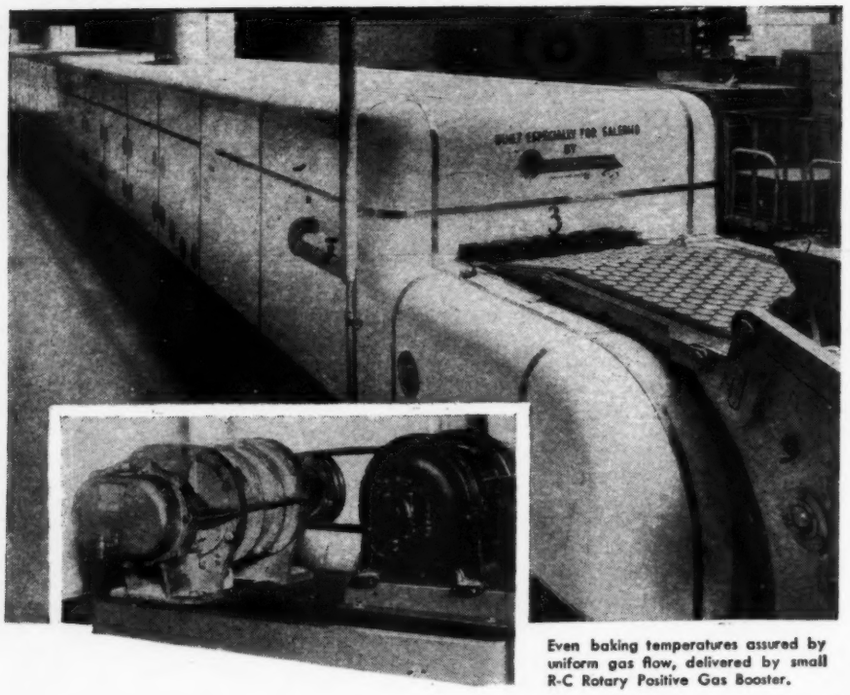
and RIGHT *where you want it*

Master Gearmotors, available in millions on millions of combinations of types and ratings, permit you to use a power drive on each job that's just right . . . a power drive that will add greatly to the compactness, appearance, and economy of each of your applications.

Use Master Gearmotors to increase the saleability of your motor-driven products . . . improve the economy, safety, and productivity of your plant equipment. They're the horsesense way to use horsepower.

MASTER GEARMOTORS

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



Even baking temperatures assured by uniform gas flow, delivered by small R-C Rotary Positive Gas Booster.

COOKIES, CHEMICALS, OR CASTINGS . .

they're all the same to

R-C *dual-ability*

ROTARY POSITIVE

No small valves, vanes or parts in the simple R-C Rotary Positive units—successfully used for almost a century of industrial progress.

CENTRIFUGAL

R-C Centrifugal Blowers offer an extensive choice of proved modern designs, where this type is better adapted to any specific application.

Uneven flow of fuel or air in industrial heating processes causes varying temperatures, inferior production quality. That's costly, whether you're processing foods, plastics, metals or textiles.

Roots-Connersville Rotary Positive Blowers and Gas Pumps have a long record of success in such applications. With only two moving parts, their simple, sturdy construction assures long-time, trouble-free performance.

Or, if Centrifugal Blowers or Exhausters meet your needs better, you'll enjoy similar full satisfaction from the advanced engineering built into this type of R-C units. We're unbiased in our recommendations because we build both types equally well. That's what we mean by R-C *dual-ability*.

We'll help you select standard R-C equipment of any capacity, or design special units to match your needs. Consult us without obligation.

ROOTS-CONNERSVILLE BLOWER CORP.

One of the Dresser Industries

611 Central Ave., Connersville, Indiana

Roots CONNERSVILLE SINCE 1854

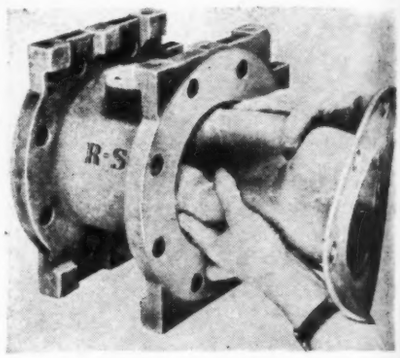
BLOWERS FOR EVERY NEED

ROTARY POSITIVE AND CENTRIFUGAL BLOWERS • EXHAUSTERS • BOOSTERS
LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

rollers; double stops, one set in drawer and one in carrier. Firm follow blocks slide full length of drawer, and drawers are removed without unlatching stops or catches. Back of drawer has hand grip. Suspension models are of regular height with three letter drawers and two card drawers, or counter height with three or two letter drawers. In the legal size, two-, three-, and four-drawer files are available. In non-suspension type, two- and four-drawer files are built in both letter and legal sizes. Lyon Metal Products, Inc., 622 Clark St., Aurora, Ill.

BUTTERFLY VALVE

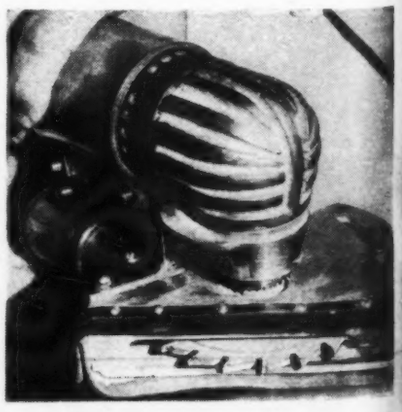
Complete shut-off is said to be attained by butterfly valve featuring rubber spool. Acting as seat and flanges, the spool offers a pliant cushion to the wedge-like closure of butterfly vane in valve. It is made of rubber, flexible,



tough, and capable of service in the temperature range of —20 to +200 deg.F. Requires no special attachments to hold it in position. The heavy flanges of the spool are bored to correspond with bolt holes, and act as gaskets. The valve is made in sizes to handle 15 to 125 p.s.i., using 125-lb. standard American flanges. R-S Products Corp., Valve Div., Philadelphia 44.

ELECTRIC SAW

Applicable for use in installing heating and control equipment in buildings, electric saw features Carboloy cemented carbide teeth designed to cut a smooth clean groove in plaster or concrete walls and floors. The copper tubing of the



TINNERMAN NEWS EXTRA

CLEVELAND, NOVEMBER, 1946

76TH YEAR OF TINNERMAN PROGRESS

BUYERS GET HOT TIP

MASS PRODUCTION OF NEW SERIES SPEED NUTS RESPONSIBLE FOR LOWEST PRICES IN HISTORY

Shrewd, alert, cost-conscious John Buyer, speaking today for American Industry, admitted wide affect of latest Tinnerman Announcement. He predicted that, "The new C7000 Series Speed Nuts, costing less than threaded nuts plus lock washers, will save hundreds of thousands of dollars, as well as give impetus to better and faster assembly of mass production products". From Cleveland comes word that large stocks are on hand for immediate delivery. Prices and samples of the new Speed Nuts can be had for the asking.

Buyers Determine Savings by Checking Present Purchases of Threaded Nuts and Lock Washers

It is a simple matter to determine the savings made in the assembly of any product by converting to C7000 Series Speed Nuts.

Buyers are simply taking count of the number of threaded nuts and lock washers used daily on machine screws and sheet metal screws. For example, one manufacturer using 18,000 threaded nuts and lock washers per day found that the total consumption exceeded 5 million a year. The annual net saving by conversion to spring-tension Speed Nuts ran into a substantial figure. In addition to saving on the cost per thousand, converting to Speed Nuts also gave the advantage of time saving. Speed Nuts are applied faster, reduced weight, lower transportation charges and it eliminates the old problem of loosening.

Then too, in many assemblies space is limited. A Speed Nut can be applied where the space is too small to apply threaded nut and lock washers without costly wasting delays.

Even if the C7000 Series Speed Nuts cost more than threaded nuts and lock washers, they would bring down the total net assembly cost. But with their lower price, savings are still greater on the product using machine screws or sheet metal screws in any of the ten most popular sizes.

The C7000 Series Speed Nuts are accurately heat treated, given a rust resisting finish, and have a live action spring steel locking screw with a firm grip. Locking action is fully prevented because the spring steel nut absorbs the vibration which causes loosening in conventional threaded nuts.

Billions of Speed Nuts have proved their work on hundreds of mass production products for more than a decade. The time to cash in is now. Every day's delay is a day's loss in savings otherwise effected.

NEW SPEED NUTS HAVE RUST-RESISTING FINISH

The corroding and rusting of ordinary threaded nuts presents a serious problem in connection with [illegible] and replacing [illegible] nuts must be [illegible] Having no

SPEED NUTS ELIMINATE LOCK WASHERS

With the use of C7000 Speed Nuts, the lock washer is unnecessary and obsolete. The cost of the lock washer plus the cost to supply a spring-tension feature to the threaded nut and the assembly part. With the spring-tension feature incorporated in the Speed Nut, only one part is necessary instead of two. Only one part to handle. Only one part to install. And because this, the Speed Nut affords a spring-tension that can't be beat. Tight over the nut. And Speed Nuts never have to be chiseled or sawed off to remove with a lock washer. Simply use a new nut for replacement.

There's no expensive damage when Speed Nuts are used. For Speed Nuts have a resiliency that prevents [illegible] ing parts to such a degree that porcelain enamel, glass or plastic might crack or chip.

Speed Nuts are also insurance against damage in transit. Your products are subject to severe vibration and shock while being packed, handled and shipped. Speed Nuts provide a resiliency that cushions and protects porcelain enamel and glass assemblies against damage.

Eliminating a lock washer not only cuts the number of parts in half but it also cuts the work in half. The Speed Nut also has a wider bearing surface. That feature also prevents distortion of the panel or part to which the nut holds.

When you cut down the amount of buying you reduce stocking problems and handling problems. You save on transportation charges and you have a nut that does a more satisfactory holding job.

Shrewd, alert, cost-conscious John Buyer, speaking today for American Industry, admitted wide affect of latest Tinnerman Announcement. He predicted that, "The new C7000 Series Speed Nuts, costing less than threaded nuts plus lock washers, will save hundreds of thousands of dollars, as well as give impetus to better and faster assembly of mass production products". From Cleveland comes word that large stocks are on hand for immediate delivery. Prices and samples of the new Speed Nuts can be had for the asking.

Greater Strength is Result of 20 Years of Engineering Experience

Back of the C7000 Series is all the experience of the Tinnerman factories and their extensive engineering development department. For more than 20 years the Tinnerman organization has devoted itself to studying and solving assembly problems. No other organization has a comparable record of engineering development in this field.

Speed Nuts

TINNERMAN PRODUCTS, INC. • 2096 FULTON ROAD • CLEVELAND 13, OHIO

IF YOU WANT TO SHOW
Pleasing
Profits
Mechanize your material handling operations and stop worrying about price increases.
You can *insure* your profit position by converting your unskilled labor into skilled labor and achieve mass production at low cost.
CLARK TRUCTRACTOR conducts surveys of material movements and recommends new methods and means to reduce production costs.
A copy of Clark's "Material Handling News" is yours for the asking.
Plan to visit our exhibit, National Material Handling Exposition, Cleveland, January 14 to 17, 1947.
1000 TO 7000 LB. LOADS
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CLARK TRUCTRACTOR
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FORK LIFT TRUCKS TOWING TRACTORS TRANSMISSIONS
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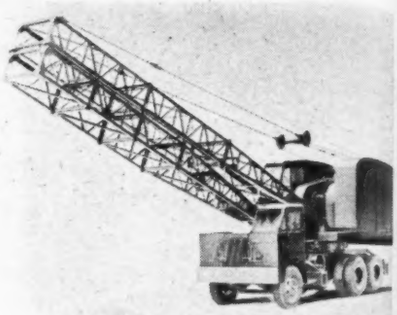
RAILWAY TRUCKS DRILLS & GEARS
METAL SPOKE WHEELS ELECTRIC STEEL CASTINGS
Prices on CLARK products will not be advanced in excess of increased costs.

control system can then be embedded in the grooves and covered with plastic filler and masking tape, so that the completed job is virtually unnoticeable. A suction guard attached to vacuum cleaner in saw picks up all dust, loose plaster, or cement produced during the sawing operation. Minneapolis-Honeywell Regulator Co., 2709 Fourth Ave. S., Minneapolis 8.

TRUCK CRANE

Lifting capacity of Model 304 truck crane is 40,000 pounds with outriggers, 15,800 pounds without outriggers. The same base machine used by the manufacturer on the Model 304 crawler is utilized by this truck crane, but the additional strength built into it provides extra lifting capacity. Designed for maneuverability on street or highway, and high travel speed. Equipped with



hinged folding boom and pendant boom suspension which simplifies changes in boom length and is said to materially reduce the cost of cable. Booms are available in lengths up to 110 feet, and jib boom extensions in 15- to 30-ft. sizes. Removable outriggers that permit operation as a shovel, pull shovel, or dragline, are optional. Koehring Co., 3026 West Concordia Ave., Milwaukee 10.

CHANGE IN OWNERSHIP

The Permutit Company, New York manufacturers of water conditioning equipment, industrial ion exchangers, and power plant equipment, has acquired the Simplex Valve and Meter Company of Philadelphia. Designing and manufacturing equipment for the control and regulation of liquid flow, the Simplex Company will continue to operate under its own name.

OXYGEN INDICATOR

Type C indicator measures the oxygen content of gaseous mixtures in chemical, metallurgical, petroleum, and allied industries. Employs electrolytic detector cell in conjunction with a direct reading meter having a linear scale to indicate the percentage of oxygen in the sample. Available in standard, full-scale ranges of 0-0.5, 0-5, 0-10, or 0-25 percent. Ad-

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and for long service—
USE J&L SEAMLESS PIPE

J&L steel pipe is made of J&L Controlled Quality steel especially for bending and welding in power plant installations. The long experience and skill of J&L men enables you to obtain a pipe that has uniform wall thickness, is clean and straight for your most exacting installations. J&L steel pipe is made to give long and satisfactory service. Write for information.

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EVERY INCH OF SPACE PAY ITS WAY

with

THE TURNER SYSTEM

OF MATERIALS HANDLING

Here is the vertical and horizontal expansion system that has proved its Savings in Space, Labor and Equipment to hundreds of leading manufacturers. With the TURNER SYSTEM every Box, Bin, Shelf and Rack in your plant is STANDARDIZED, INTERCHANGEABLE and MOVABLE. Everything is on wheels and ready to go — efficiency that saves its cost many times.

Note These Features:

1. The Transport is half truck and half platform—has the advantages of both, the disadvantages of neither.

2. Vertical expansion of loads saves valuable floor space. No "stooping or diving" into bins because sections are put on or taken off as needed.

3. The system puts all materials within arm's reach of operator — no walking back and forth.

4. All units ruggedly constructed — last indefinitely. All are riveted or welded—no nuts, bolts or screws to come loose.

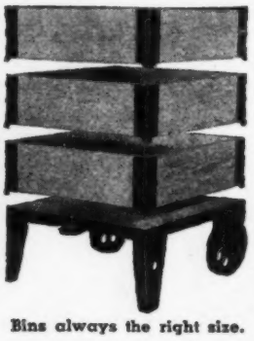
Shelf Racks mounted on Turner Transport. May be lined up side by side — quickly moved as material is needed.

Removable Bin Sections (wooden side or all steel) fit on Turner Transport, ready for transportation by hand "Jimmy," power lift truck, crane or tractor.

60 DAYS FREE TRIAL in Your Plant

Send at once for an assortment of standard units. Keep them two months. Return them if not more than satisfied. Trial costs you nothing except transportation charges.

Write Today for This Assortment. Complete Data on the TURNER SYSTEM will follow immediately.



Bins always the right size.

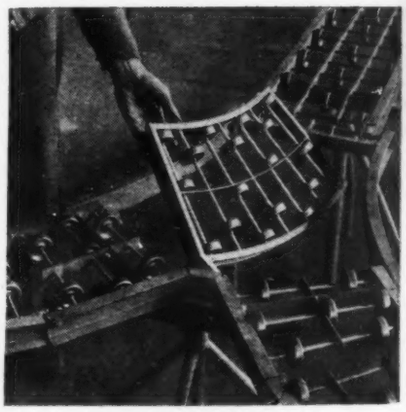
FACTORY SERVICE COMPANY

4605 N. TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

justable high point contacting device permits automatic activation of warning signals or control circuits when oxygen concentration exceeds a predetermined limit. Electronic or galvanometer potentiometer recorder can be attached to produce a graphic record of oxygen concentrations. Mine Safety Appliances Co., Pittsburgh 8.

ROLLER CONVEYOR SWITCH

The "Y" Flipswitch, for converging two gravity roller conveyors, speeds up loading and unloading materials by making double production lines possible, and simplifying control. Flow of materials is controlled through a semi-automatic switch, operating entirely through gravity. All three end limbs of



the switch are equipped with male studs and can be connected to any other conveyor sections without tools. Features minimum upkeep and maintenance, and is adaptable to the requirements of individual plants. Can be used on loading platforms, in warehouses, and in production lines. Speedways Conveyors, Inc., Buffalo, N. Y.

RECESSED TROFFERS

Special K.O.s in the ends of recessed troffers permit lampholders to be inset flush with outside surface of the closed ends, effecting accurate 48-in. lengths, according to the manufacturer. The troffers are built as complete units. Accessories include baffles, two types of eggcrate louvres, 300-deg. white reflectors, and both flat and formed-glass

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for a long life—

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You will find that this progressive approach to effective lubrication results in better machine performance, less wear, lower maintenance costs, and extra years of useful life.

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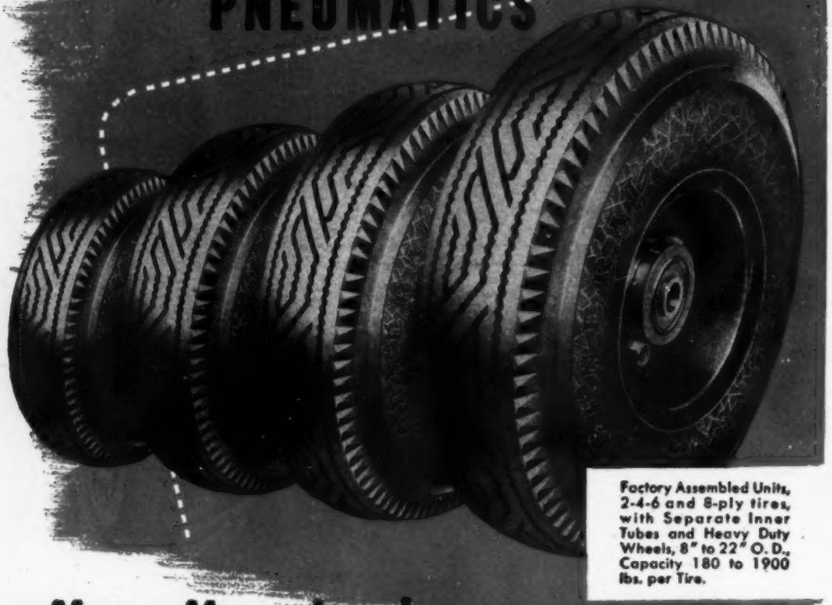
produce more at lower cost

INCREASE YOUR
MATERIAL HANDLING EFFICIENCY
with GENERAL INDUSTRIAL
PNEUMATICS



Factory Assembled Units, 2-4-6 and 8-ply tires, with Separate Inner Tubes and Heavy Duty Wheels, 8" to 22" O. D., Capacity 180 to 1900 lbs. per Tire.

Move More Loads,
FASTER, EASIER, SAFER

General Industrial Pneumatics cut material handling costs . . . move material faster, easier . . . cushion load and truck . . . end excessive floor wear . . . reduce maintenance. General Industrial Pneumatics provide:

A superior combination of rugged pneumatic tire with separate inner tube.

Heavy duty wheel in simplified sizes for interchangeability.

Easily demountable wide base rim to provide maximum load capacity and fast cushioned movement over any surface.

All units can be adapted to your present equipment. General Tire Engineers will work with you to determine the size and type of wheel unit best suited to your requirements.

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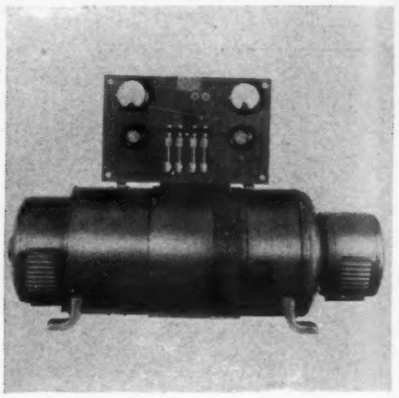
INDUSTRIAL PNEUMATIC TIRE • TUBE • WHEEL UNITS

panels. Built-in attachments permit adding or interchanging when desired. Alzak reflectors may be obtained with reflector liners. Troffers are made in two types—deep units for one, two, or three 40 watt lamps, and shallow for one or two 40 watt lamps. Both types are supplied with flange or teebar mounting edges. The Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3.

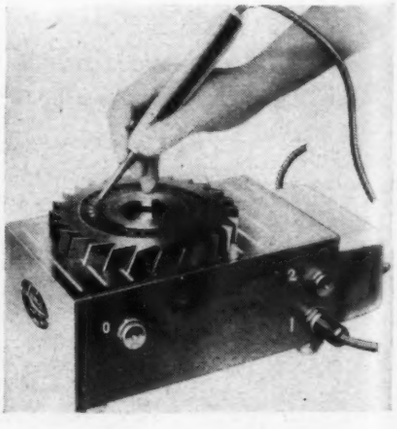
ELECTROPLATING GENERATORS

Ranging in size from 100 to 2000 amperes at 6 volts, or 1000 amperes at 12 volts, line of six low voltage electroplating generators is announced. The No. 130 model, rated 1000 amperes at 6 volts, is driven by a 10-hp. motor at 1200 r.p.m., and uses a 250-gal. capacity tank. The commutators can be connected in series to get 12 volts or less for barrel plating, electrocleaning, and similar operations. Compound wound, the generator is equipped with interpoles for sparkless commutation. Commutators with riveted risers provide cool operation, and the generator is ventilated. Motor Generator Corp., Div. of The Hobart Bros. Co., Hobart Square, Troy, Ohio.



MARKING TOOL

Combination tool is adapted to fine, deep etching on polished surfaces, as well as to demagnetizing tools which have been in contact with a magnetic chuck. Tungsten point permanently marks hard steel, stainless steel, or steel alloys. Equipped



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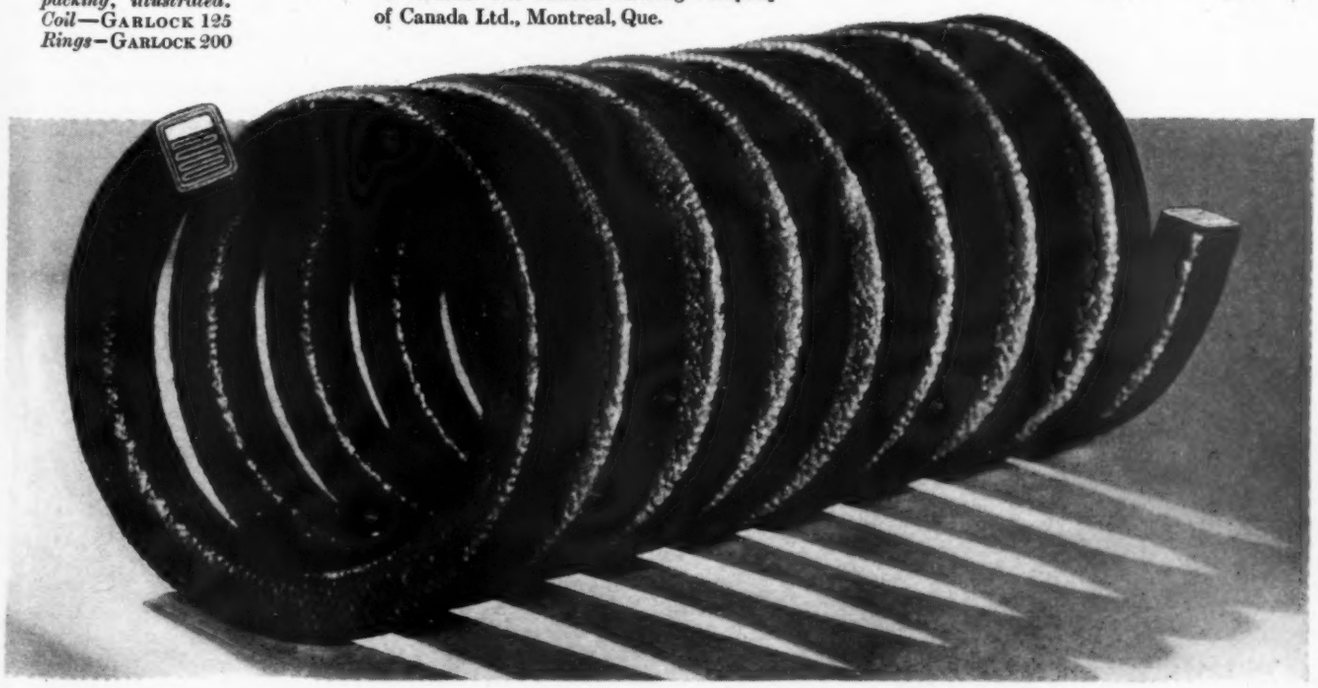
GARLOCK 150

Low in maintenance cost because it gives such *long, dependable* service. Costly shutdowns for frequent repacking are avoided. Man hours and machine hours are saved. Use GARLOCK 150 on piston rods of engines, pumps, compressors, etc., against steam pressures up to 300 lbs.

The Garlock Packing Company, Palmyra, New York

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK 150 *Spiral packing, illustrated. Coil*—GARLOCK 125 *Rings*—GARLOCK 200



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Neolac ALUMINUM

The PLASTIC ALUMINUM COATING

Neolac ready-mixed aluminum combines the chemically-resistant, waterproof properties of Neolac plastic protective coatings with the heat- and light-reflecting qualities of aluminum.

Neolac Aluminum is not an ordinary aluminum paint. It is pure aluminum in a clear, inert plastic vehicle.

Neolac Aluminum goes on easy, by brush or spray; leafs out evenly, smoothly; air dries in an hour. Its extra long life cuts recoatings in half...saves time, money and labor... gives sure-fire protection against even abnormal corrosive or weather conditions.

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- Resists Acids, Alkalies, Water, Alcohols
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- Will Not "Skin" or "Jell"
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- Easy-To-Use As Ordinary Paint
- Ready-Mixed, Ready-To-Use

Special

INTRODUCTORY OFFER

for comparative test purposes—One quart of Neolac Aluminum plus one pint of Neolac Thinner, $2.80 prepaid anywhere in the U. S. A.

Neolac is also available in white, black, clear, gray, green, red, yellow and blue.

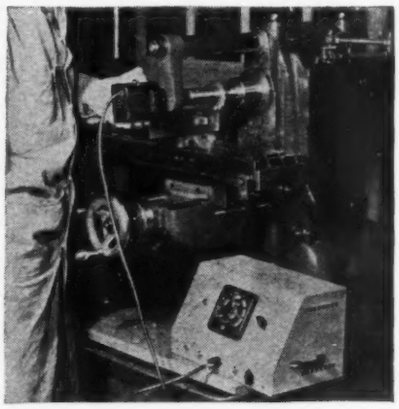
CHAMBERLAIN ENGINEERING CORPORATION

5000 BRIMFIELD ROAD, AKRON 9, OHIO

with light, medium, and heavy stages of marking control, each model has 5-ft. flexible, lightweight, detachable cable. Marking points of Elkonite, copper, or carbon are also available with the tool, and are interchangeable, having screw-type connections. Encased in aluminum, no shut-down, cooling-off period is required. Luma Electric Equipment Co., Toledo 1.

ELECTRONIC TACHOMETER

Rotating speeds from 300 to 50,000 r.p.m. can be measured with electronic tachometer without the necessity for any permanent attachments. Consists of a small pick-up head, 6 feet of flexible cable, and a measuring unit with a panel-mounted indicating instrument



reading directly in r.p.m. Either a low-speed or high-speed head can be used. The low-speed head provides ranges of O-1000, O-2000, O-5000, O-10,000, and O-20,000 r.p.m., while the high-speed head provides O-10,000, O-20,000, and O-50,000 r.p.m. Special Products Div., General Electric Co., Schenectady, N. Y.

WELDING GOGGLE

Head-rest welding goggle can be quickly thrown into "off-guard" position for inspection of set-ups. The goggle is attached by a friction joint to a comfortable headgear assembly. Using one hand, the welder can flip the goggle above his eyes, where it is held in place by the joint, permitting unimpeded vision. Adjustable for individual

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WE HOUSE IT—
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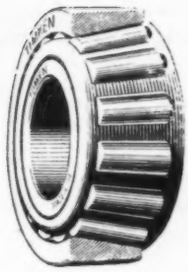

DODGE PUTS TIMKEN BEARING PRECISION INTO *WORKING CLOTHES*

THE DODGE-TIMKEN DOUBLE INTERLOCK PILLOW BLOCK provides a precision bearing assembly, *ready for immediate service.* You simply lock it on the shaft and run at full speed and full load. All the parts required for mounting this bearing are manufactured by Dodge — cast in our foundry and carried through many precision operations on the latest machine tool equipment. Dodge mounts, seals and houses the bearing assembly — with its double row of precision-finished rollers — and delivers it fully assembled, adjusted, lubricated — ready to go to work. The Dodge-Timken Double Interlock is one of the famous Dodge 30,000 hour line, covering a wide range of industrial bearing requirements, and ordinarily is available promptly from distributors' stocks. Look for the Dodge Distributor in your classified telephone directory under "Power Transmission Equipment."

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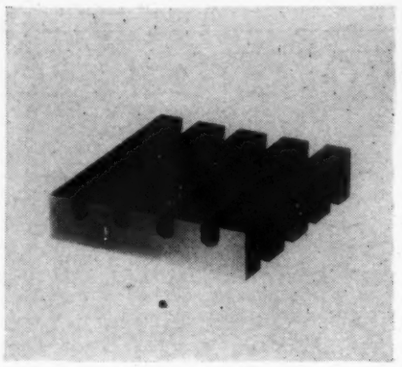
features, the device is equipped with opaque eyecups fitting directly over eyes or over personal prescription glasses. Side shields keep out stray light rays, sparks, and metal splashes, and are ventilated to reduce fogging. Available with either Noviweld or Noviweld-Didymium lenses in several shades. American Optical Co., Southbridge, Mass.

VIBRATION DAMPER

Constructed of oil-resistant synthetic rubber, pad is designed to reduce vibration transmitted from machinery and motor-driven equipment. Furnished $\frac{5}{16}$-in. thick, standard sizes are 6x6, 9x9, 12x12, and 18x18 inches. They may be cut to required size and shape, or



obtained to fill specific requirements, and may be stacked for increased isolation. The Isomode pads are placed under base or legs of machinery with or without cementing. Said to eliminate need for holddown bolts in many cases. The MB Mfg. Co., Inc., 1060 State St., New Haven 11, Conn.

REGULATING VALVE

Single-seated, internal pilot, piston-operated reducing valve is remotely adjusted from air loading panel. Designated Class LT-3, it is adaptable to process piping arrangements, particularly steam heating systems where readjustments of inaccessible valves may be hazardous or inconvenient. The air loading panel includes a small combination pressure reducing and relief valve (no continuous leak-off) mounted on a panel containing an adjustment knob and a large air pressure gage. Furnished in high-pressure bronze or cast steel body with flanged or screwed ends, the valves have interchangeable replacement parts, stellited seat rings, and hardened stainless steel 800 Brinell main valves as standard equipment. Leslie Co., 112 Delafield Ave., Lyndhurst, N. J.

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Simplex No. 2522 ball bearing bridge and industrial jack for lifting, lowering, and supporting, has a capacity of 25 tons, and will lift a maximum height of 10¼

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● Completely automatic, Hertner Motor-Generator Battery Chargers save current and protect batteries against damage. Batteries may remain in trucks while being charged or may be individually charged when removed from truck. It is not necessary for anyone to remain in attendance when a Hertner charger is in operation.

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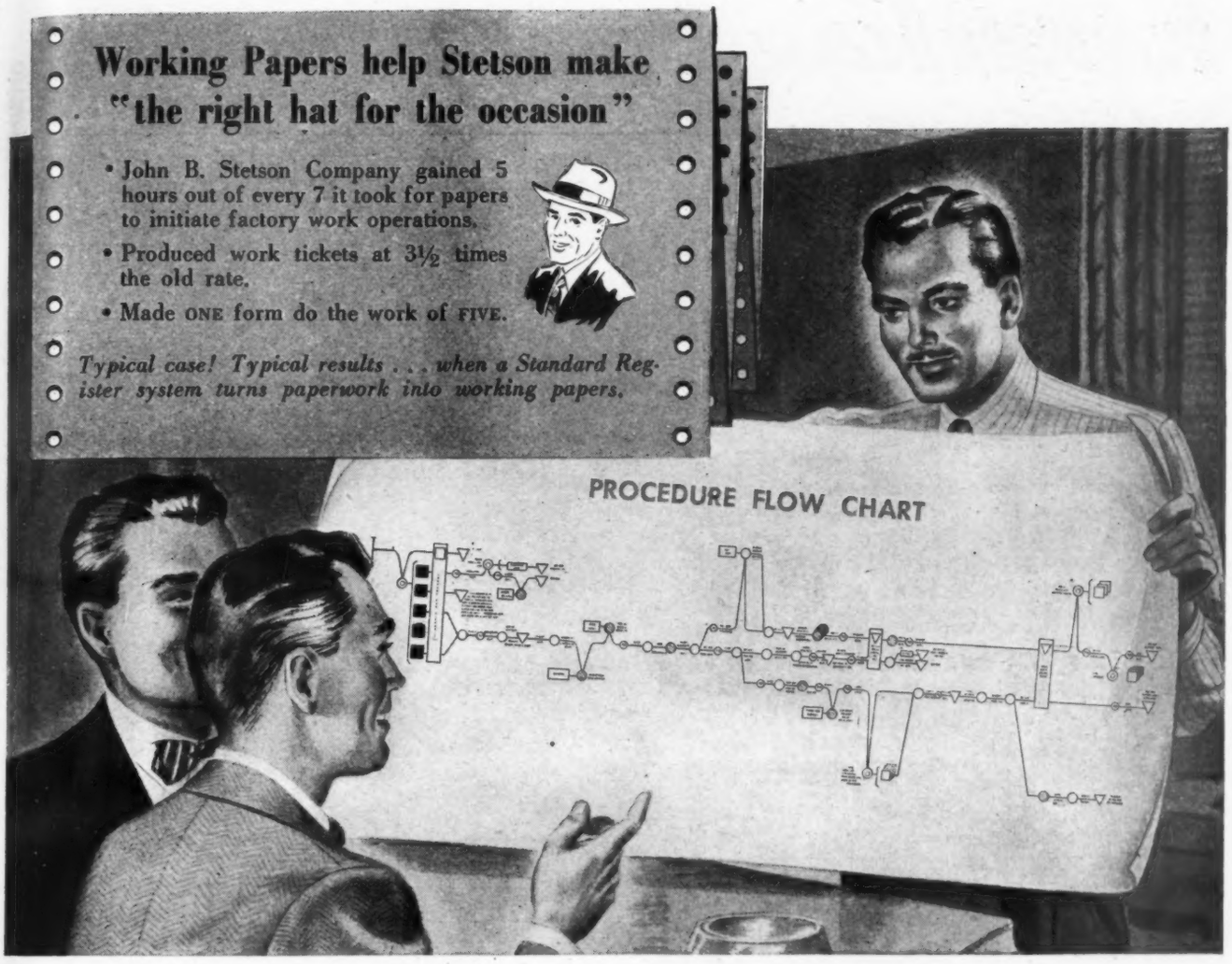
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Write, today, for your free copy of "Paperwork Simplification" which *shows how* Standard's Kant-Slip Continuous forms systems are applied to reduce business cost.

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Not in the price of printed forms. A difference in the quality of paper, printing, carbons, etc., may mean a few hundred dollars at most.

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But in the cost of business operation, if waste, delay, inefficiency exist, SAVINGS here, through better management control, can reach almost incalculable figures!

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KRANE KAR appeared 15 years ago . . . so original, so advanced in design, it made all contemporary Mobile Cranes obsolete! ***KRANE KAR*** provided, for the first time, stability without stabilizing devices, unobstructed vision, unprecedented versatility and maneuverability. ***KRANE KAR*** has no equal in a self-propelled Crane; thousands are in use in Steel and Iron plants and Foundries throughout the U. S.

KRANE KAR lifts, transports, spots loads of any shape or size up to 10 tons. No need to face the work — swing the "live" boom from side to side and up or down, by power, with full load on the hook. For indoors and outdoors service. Solid cushion or pneumatic rubber tires; 9 to 37 ft. booms or telescopic booms; gasoline or Diesel. Electric magnet, clamshell bucket, and other auxiliary equipment available. Ask for Catalog No. 58.

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THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

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SILENT HOIST & CRANE CO., 855 63rd ST., B'KLYN 20, N.Y.

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5 WAYS TO LOWER PRODUCTION COSTS WITH ONE MACHINE

THE MILLIKEN PRECISION NAILER-PINNER

1. Replaces hand work in assembly
2. Needs no skilled operators
3. Increases production—lowers unit costs
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5. Requires little maintenance—uninterrupted operation

Drives Nails, Pins, Rivets, or Drive Screws in Hardwoods, Metals, Plastics, or Composition.

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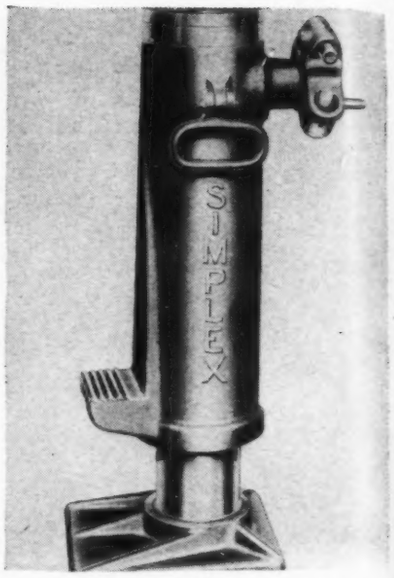
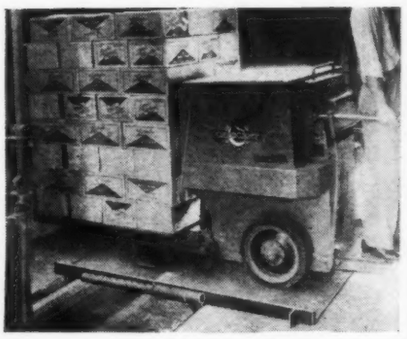


inches. Weighing 140 pounds, it lifts high or low work to full rated capacity on corrugated top cap, which is 22 inches above ground level, or on 10-in. square toe lift 4⅜ inches above ground level. Fully enclosed, dirt-proof ratchet and elevating mechanism are at top of jack instead of in base. Speedy, smooth, safe operation are said to be provided by chrome-molybdenum steel thrust bearings, heat-treated seamless alloy steel elevating sleeve, alloy steel lifting screw, and forged alloy steel gears. Templeton, Kenly & Co., 1020 South Central Ave., Chicago 44.

SAFETY LOADING BRIDGE

The Butler Safety Bridge, made of high-grade steel, can be installed to connect freight car and platform for loading or



unloading operations. It features a positive locking device, side guards, and non-skid surface with beveled edge for easy entry. Craig-Holden Associates, Box 866, Ft. Worth, Texas.

ELECTRONIC TIMERS

Allowing either fully automatic or semi-automatic control of equipment, Promatic electronic timers also can be adapted for non-timing applications. Two or more instruments control a number of individually timed operations

Trouble-Proof

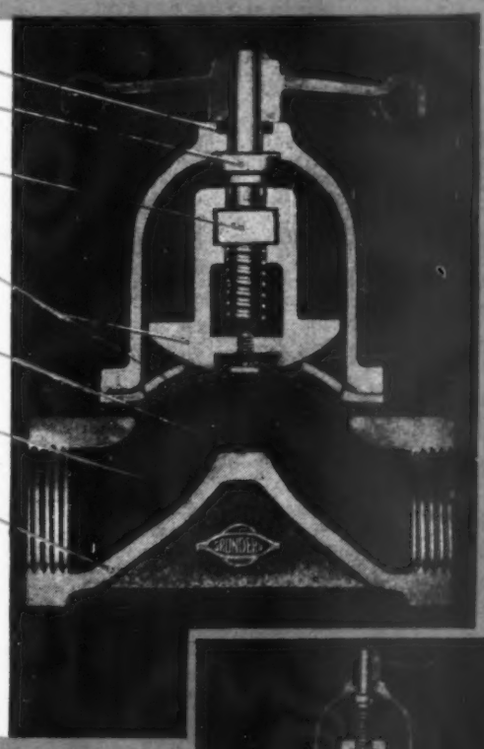
AGAINST CORROSION, CLOGGING AND PRODUCT CONTAMINATION

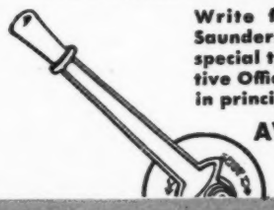
GRINNELL-SAUNDERS DIAPHRAGM VALVES

Screwed or Flanged Patterns

Users of compressed air, gases, viscous or corrosive liquids, food products and fluids containing suspended solids — this is the valve that may eliminate your troubles!

- ★ No packing glands to demand constant attention.
- ★ Non-rising stem eliminates breakage. Stem is protected from dust, weather and corrosion.
- ★ Working parts completely isolated from the fluid. No sticking, corroding or clogging to interfere with easy operation and tight closure. No contamination from valve lubricants.
- ★ Compressor and finger plate combine to support the diaphragm in all positions.
- ★ The large area of contact of the diaphragm on the seat, plus the resilience of the diaphragm, permits positive closure even when foreign matter is trapped.
- ★ No metal-to-metal seats to become damaged, wire-drawn or scored. No refacing, reseating or grinding is required.
- ★ Streamlined passage without pockets reduces friction to a minimum and prevents accumulation of sludge and foreign solids.
- ★ The valve body — the only metal that could contact the fluid — can be completely lined with glass, porcelain, lead, rubber or synthetic compounds (flange type only) to suit service requirements.





Write for catalog describing Grinnell-Saunders Diaphragm Valves — standard and special types. Grinnell Company, Inc., Executive Offices, Providence 1, R. I. Branch offices in principal cities.

AVAILABLE IN SPECIAL TYPES

The "quick operating" lever design is one of several types.

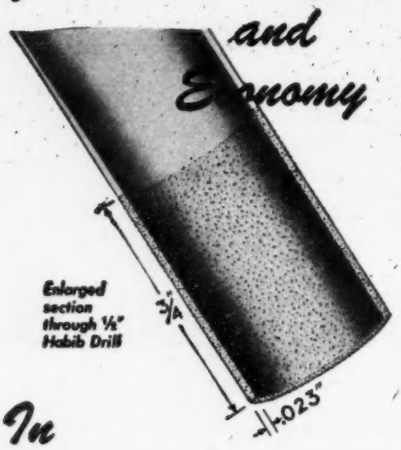
VALVE OPEN

VALVE CLOSED

GRINNELL

WHENEVER **PIPING** IS INVOLVED

Here's Why **HABIB DIAMOND DRILLS** *Give* **NEW** *Speed and Economy*



In

DRILLING or TREPANNING GLASS and ALL OTHER ABRASIVE MATERIALS

1. The RADICALLY DIFFERENT Habib drills are ***diamond-impregnated throughout the entire wall section.*** Thus—unlike any other drills—they ***always cut with a diamond-studded EDGE*** (never with the sides alone); give cleaner, faster cutting throughout an extra-long service life.

2. Having a wall thickness of only .023" (approx.), Habib drills remove a minimum of material—which again means rapid cutting action.

3. All Habib drills have a diamond section ¾" long; good for many thousands of holes.

4. The drilled core is ***ejected automatically*** by spring action (not shown in picture above).

5. Habib drills can be furnished in all sizes from 3/32" to 3" diameter, and used in any standard drill press having spindle speeds up to 4000 r.p.m.

For through-hole drilling or trepanning in ANY brittle or abrasive material, it will pay you to specify Habib Diamond Drills. Full information on request.

THE Wickman CORPORATION
15533 WOODROW WILSON AVE.
DETROIT 3 • MICHIGAN

A. C. WICKMAN (Canada) Ltd.
P. O. Box 9, Station N, Toronto, Ont.

in a predetermined sequence. Timing period is controlled by means of a plug-in type condenser unit and a variable resistor with a graduated dial. Five timing periods are available in ranges of ½-cycle to 1.2 seconds, ½ to 8, ¾ to 15, 1.5 to 30, and 3 to 60 seconds. The timer is made in both 110- and 220-volt types, 60 cycles a.c., with relay contacts rated at 10 amperes. Timers for d.c. operation are also available. General Control Co., 1200 Soldiers Field Rd., Boston 34.

LIQUID LEVEL INDICATOR

The quantity of oil, solvent, or other liquid remaining in any standard steel drum is shown on an indicator now on the market. Eliminating need for tapping and measuring, it permits a daily visual check on liquid contents. The indicator is screwed into drum faucet opening, and the faucet inserted in opening on indicator body. Wrench pads permit tight mounting, and locking device secures installation. Indicator fits standard ¾-in. pipe thread. U. C. Indicator Co., 624 East Locust St., Milwaukee 2.

LAMP BALLAST

Tulamp, disc-shaped, high-power-factor ballast for the operation of two 12-in. Circline lamps, is said to practically eliminate cyclic light variation (stroboscopic effect) because the lamps are

where is that ODOR coming from?

No matter the source—give Oakite TRI-SAN a chance to get at it! Oakite TRI-SAN does not camouflage unpleasant odors with a sweet-smelling substitute. It kills them at the source . . . leaves no evidence. Try it TODAY! Costs only a penny for adequate solution of 1 ounce TRI-SAN to a gallon of hot or cold water. And, for that same penny, in addition to its deodorizing action, Oakite TRI-SAN removes light soil and disinfects . . . all in the same simple application.

Free booklet gives details

Specially prepared 20-page booklet gives performance-proved suggestions for the speedy, low-cost sanitizing of:—

Toilets	Cafeterias
Washrooms	Garbage Receivers
Rest Rooms	Drains
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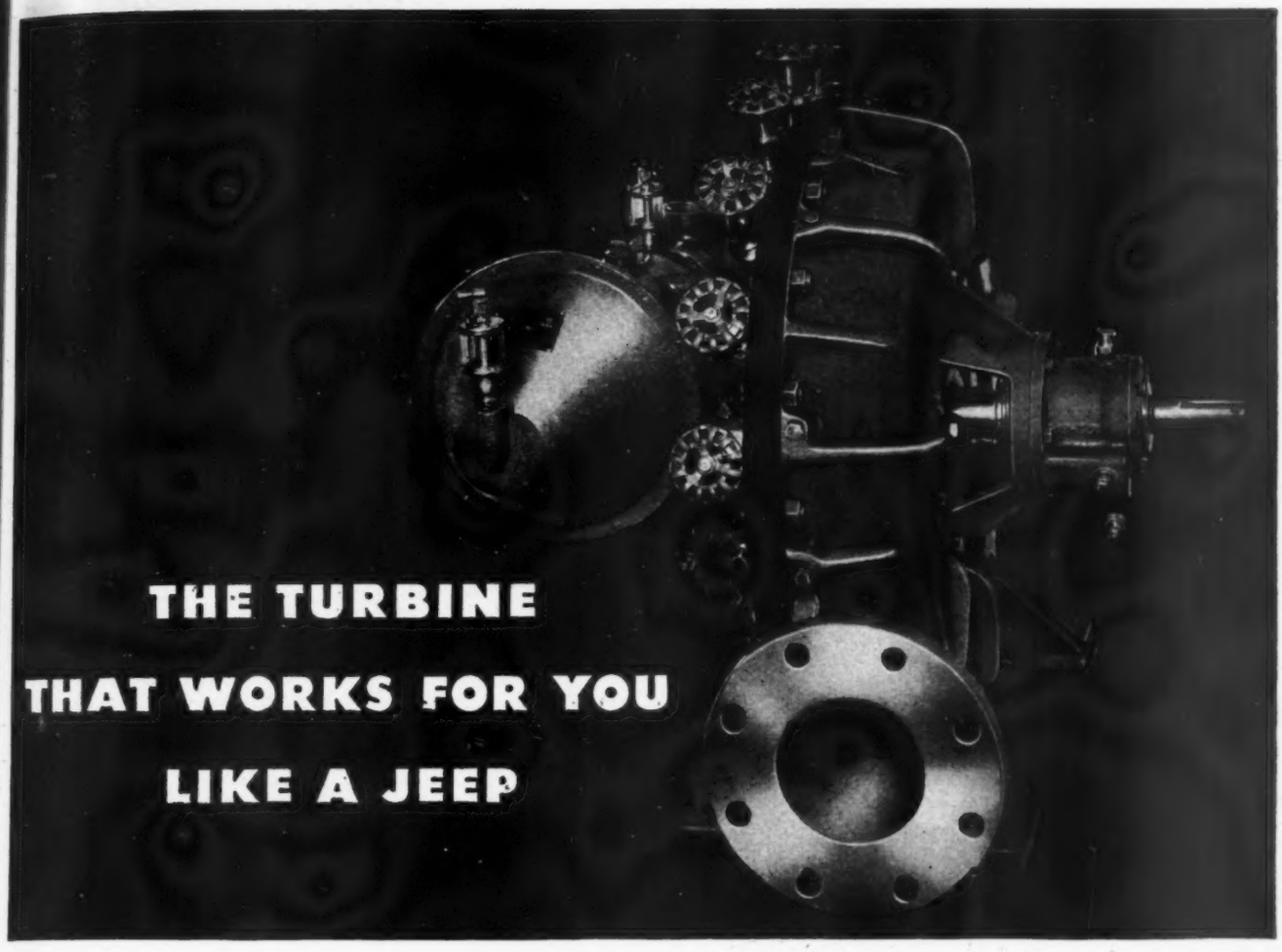
MATERIALS • METHODS • SERVICE



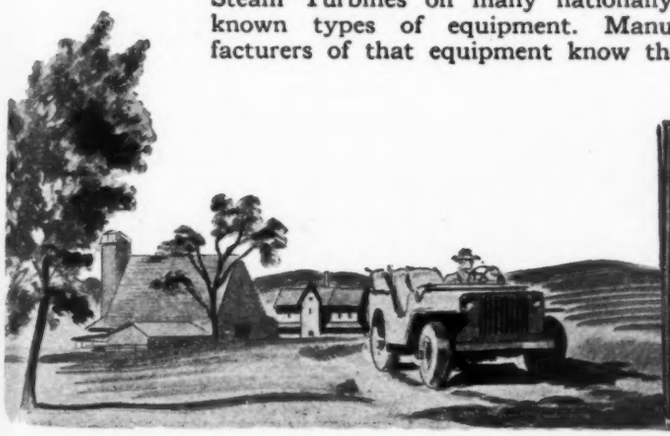
Small, but powerful . . . like a jeep. That's the Coppus Steam Turbine that you see around so many places powering pumps, blowers, fans, stokers and other equipment requiring a steady, sturdy source of small HP.

The Coppus line of "Blue Ribbon" turbines runs from 150 HP down to fractional — there are six frame sizes, and prices are in proportion. You can match a Coppus turbine to the job, saving the money you might otherwise spend for a turbine that's larger than necessary.

You'll see Coppus "Blue Ribbon" Steam Turbines on many nationally-known types of equipment. Manufacturers of that equipment know the quality that is represented by the Coppus "Blue Ribbon" — more than 85% of all orders since 1937 has been repeat business.

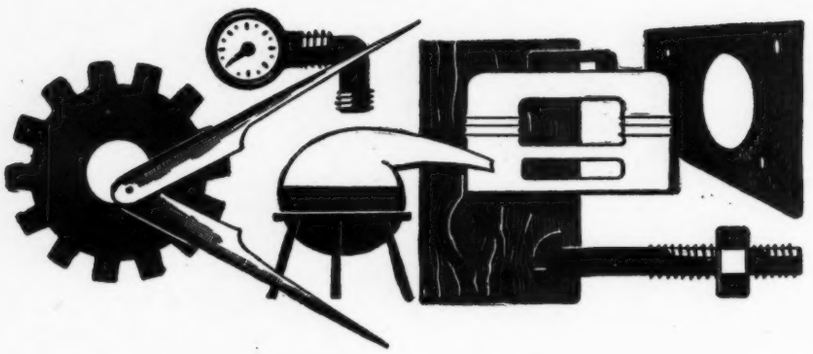
Select the right size of Coppus turbine for any job that calls for "jeep duty". Like all Coppus "Blue Ribbon" products (blowers, ventilators, gas burners, etc.), they are made to extremely close tolerances with accuracy controlled by Johansson size blanks. Before shipment, every turbine is dynamometer-tested.

Write for Bulletin 135–10. Coppus Engineering Corporation, 331 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in SWEET'S.



ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

Trying to Find *Parts Suppliers?*

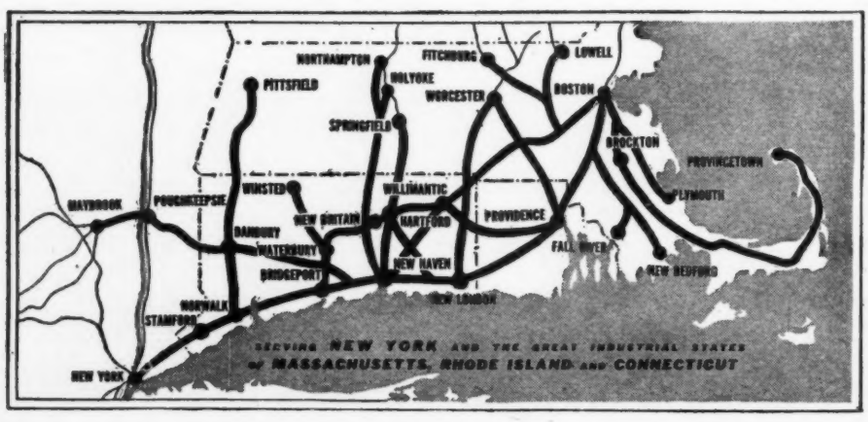


13,403 manufacturers are located in Southern New England.

If it's made out of metal, chemicals, fiber, wood, plastics or almost any other material, you won't have far to look in Southern New England. Here 13,403 manufacturers produce over 200 distinct classes of goods . . . nearly two-thirds of all types in the nation.

Easy access to parts suppliers is just one of many factors in your favor when you locate your plant in the compact industrial area served by The New Haven Railroad. For a complete, concise resume of all the advantages, write for a copy of the new 32-page booklet, "SOUTHERN NEW ENGLAND FOR TOMORROW'S INDUSTRY." Address: P. E. Benjamin, Mgr., Industrial Development, New Haven Railroad, Room 201J, 80 Federal Street, Boston 10, Massachusetts.

THE **NEW HAVEN** R. R.



operated out of phase with each other. The flat disc construction, with a center hole for mounting, permits it to be assembled on the stem of a portable lamp, or concealed in lamp base. It is also adaptable to shallow-type wall or ceiling fixtures. Junction box available includes a mounting bracket. Specialty Transformer Div., General Electric Co., Schenectady, N. Y.

OIL SEAL PACKING

Developed for the protection of bearings, oil seal packing, known as Clipper Seal, is made with a heel of resin-bonded fabric, and a lip of a tough but soft flexible compound. Lip design makes it possible to vary the bearing area and control the pressure of the lip against the shaft. Of one-piece, concentrically molded construction, it is claimed to provide a lu-

bricant-retaining, dirt-excluding seal, automatic in operation, adaptable to a wide range of conditions, and resistant to most forms of corrosion. Made for shafts from $1\frac{5}{16}$- to 37-in. diameter, in endless and split types, designs are available for different conditions. Johns-Manville Corp., Manville, N. J.

REFLECTIVE ROOF COATING

Known as Richlume, roof coating is claimed to have high resistance to weathering, heat, cold, and salt water, as well as the ability to water-proof any bituminous roofing material which is not torn open or cracked too widely to be bridged by the coating. Also to have in-

Have you found it hard to obtain Swiss Pattern files?

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X. F. means Extra Fine and is part of the trade-mark which distinguishes the Swiss Pattern files made by Nicholson and sold in greater quantities than any other Swiss or Swiss Type brand.

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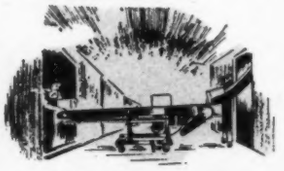
it's Portable...Adjustable...Reversible

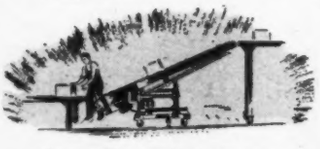
MAIL the coupon today for folder showing the 101 uses of this handy conveyor. It shows how you can save time and labor in loading and unloading freight cars, trucks and planes . . . in stacking and unstacking cartons in your warehouse . . . how you can increase the travel of your gravity conveyors and feed an overhead conveyor at any point along the line.

Lamson Corporation—a pioneer manufacturer of materials handling conveyors—offers a limited quantity of this guaranteed utility conveyor for immediate delivery.

Helps you load and unload cars and trucks.



Spans dock from warehouse to freight car.



Acts as Booster between two portable, roller gravity conveyors.

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Syracuse 1, N. Y.

Send me, without obligation, your folder and prices on the Lamson Utility Conveyor.

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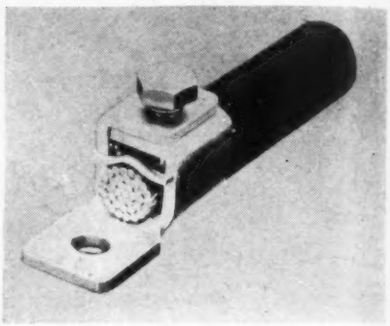
Company.....

Address..... State.....

sulating and fire-resistant properties. Applied with brush or spray to tar-and-gravel, tar paper, built-up asphalt, or composition shingle roofs, it is not an aluminum paint, but a coating for bituminous roofing. The plastic vehicle for the aluminum pigment in the compound is said to produce a close bond with roofing materials without penetrating below the roof surface. The vehicle remains flexible, allowing coating to expand and contract with the roofing under any weather conditions, and to reflect up to 80 percent of the sun's rays. The Richkraft Co., Chicago.

SOLDERLESS LUGS

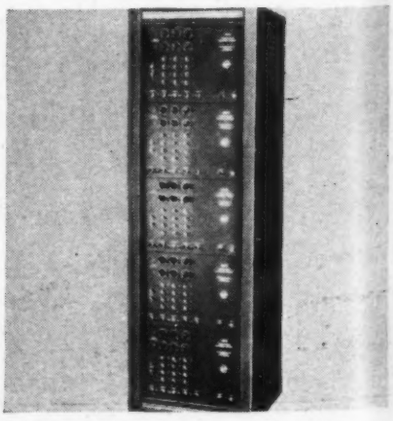
Size KPA34 Scrulug, accommodating a range of wire and cable sizes from No. 4/O wire to 500 Mcm. cable, has the operating characteristics of the largest



cable. Formed from copper and brazed for added strength, it is installed by tightening clamping bolt, which forces a pressure bar on the cable. Burndy Engineering Co., Inc., 107 Bruckner Blvd., New York 54.

ELECTRONIC COUNTERS

Serving as a centralized control over a number of independent machine processes, Model 69-3 counter consists of 5 dual predetermined electronic counters. Three standard 4-tube decades are used for precision control of time sequences of events, time interval recording, counting small objects, counting radiation particles, and totalling variable quantities from several independent channels. Counting rates up to 12,000



METAL-CUTTING LUBRICATION

PERFECT RESULTS in Drilling, Reaming, Boring and Milling of Aluminum

"Recently we were called in to the plant of a large manufacturer in Ohio to look over a Cutting Oil job on aluminum work.

"The material to be formed was an aluminum die cast block. This block is a part of the lock mechanism on bank vaults and consequently must be about perfect in the machining.

Lubrication Engineer's Report

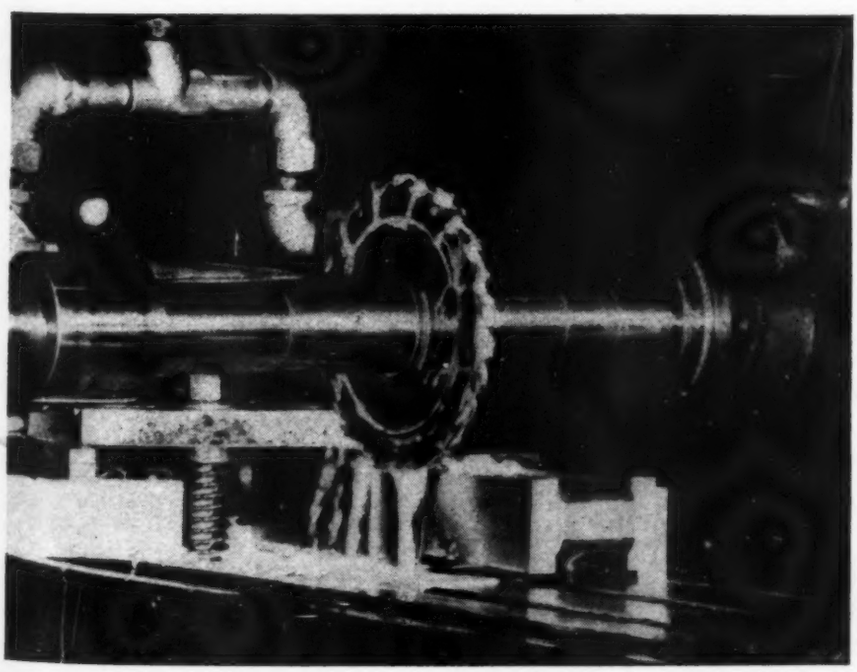
"The work to be done on this block included drilling, reaming, boring and milling.

"After studying the conditions, we recommended Cities Service Chillo Oil No. 22 and received an order for a drum of this material for trial use.

"We were called back about two weeks later and the plant superintendent came up with one of the blocks which he had machined with the oil recommended. He was completely satisfied with the results. The block had not only a smooth machine finish, but a completely burnished finish. It was a beautiful piece of work.

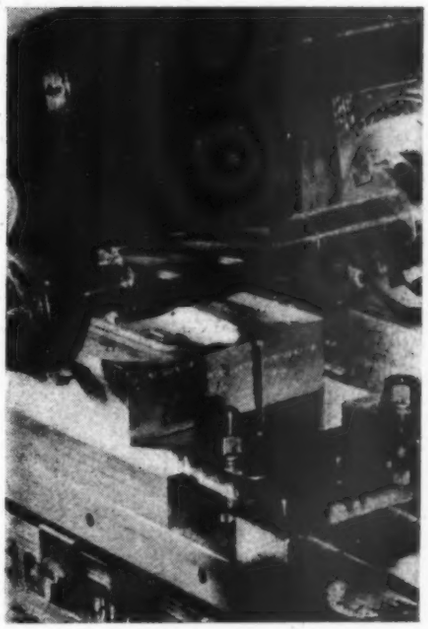
Smooth, Burnished Finish

"As a result this plant has standardized on Chillo Oil No. 22 for all aluminum machining and we are currently receiving orders for the oil as required.



"Our unusually successful experience with Chillo Oil No. 22 leads us to recommend it for practically all aluminum machine work."

Through continual contact with the many and varied lubrication problems encountered by industry over the years, Cities Service Lubrication Engineers have accumulated considerable information on ways and means for reducing costs and improving the performance of lubricants. Why not find out for yourself how they can help *you!* Contact your nearest Cities Service branch office or write to Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y. (In the South, Arkansas Fuel Oil Company.)



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Statement by Mr. Harry Woodhead
President Consolidated Vultee Aircraft Corp.

"San Diego's year 'round mildness of climate has proven very advantageous. We can work out of doors every month on many of our finishing operations and make test flights whenever we are ready. We also avoid extremes of heat, cold and humidity which add unnecessary cost to many manufacturing operations."

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- Labor pool of skilled and efficient workers.
- Plenty of natural gas and electric power.
- Nation's 21st richest agricultural county.
- 3rd largest U.S. market within 125 miles.

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SAN DIEGO GAS & ELECTRIC COMPANY

per minute may be obtained with the instrument, maker states. For actuating the input to the counter, a simple contactor or a photo-electric pick-up may be used, and the output is provided with a single-contact double-throw high-speed relay. Modifications are available for specific requirements. Potter Instrument Co., 136-56 Roosevelt Ave., Flushing, N. Y.

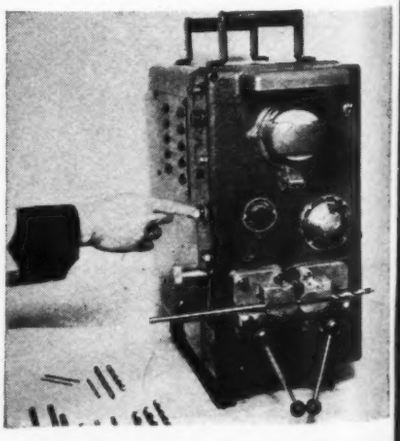
RUBBER FLOOR COVERING

Designed to reduce worker fatigue where a major part of the work is done from a standing position, rubber link floor covering is said to provide lifetime, virtually indestructible skidproof and

shock-absorbing underfooting. Furnished by the square foot in any size to meet specifications, it can be fitted to odd-shaped rooms. Available in special-purpose mats for work areas or as a wall-to-wall floor covering. The Loewenthal Co., 188 West Randolph St., Chicago, Ill.

AUTOMATIC WELDER

Repairing small tools, butt welding tool bit extensions and shanks, and joining band saw blades from $\frac{1}{16}$- to $1\frac{1}{4}$-in. width, portable welder is designed to provide a quick economical method of joining most metals. Features include built-in grinder, automatic motor-controlled feed of material, and cam-operated lever method of clamping to speed up the operation. Welding is fully



Kodak

KODAK TRANSFAX PROCESS

Here is how it works . . .

YOU SPRAY TRANSFAX . . . a white, light-sensitive, quick-drying material . . . on your product-surface. Some surfaces need special primers.

You place on the Transfax-coated surface a transparent or translucent original of the design or legend, and expose to strong light.

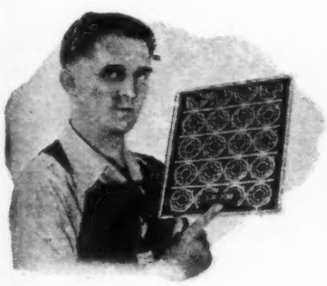
You wash the surface with a weak ammonia solution.

You get a Transfax reproduction of the original which is accurate, tough, rubproof, oilproof.

You get it quickly . . . at low cost . . . without a darkroom . . . and the job can be handled by anyone with ordinary skill.

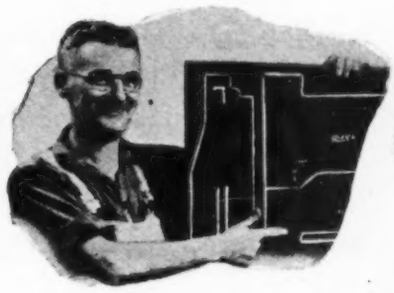
Here are 4 possible uses . . .

. . . for name plates or monograms



. . . for dials or scales

. . . for fabricating directions



. . . for wiring or piping diagrams

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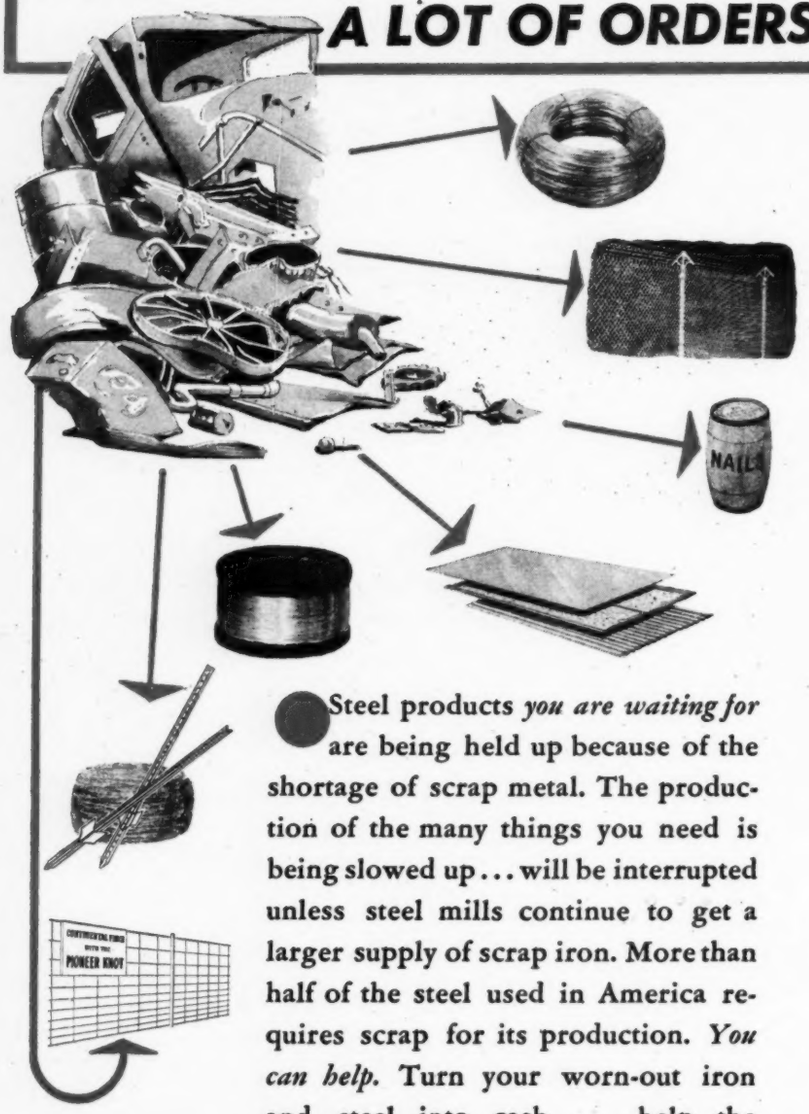
17

YOUR SCRAP-PILE CAN FILL A LOT OF ORDERS



Steel products *you are waiting for* are being held up because of the shortage of scrap metal. The production of the many things you need is being slowed up... will be interrupted unless steel mills continue to get a larger supply of scrap iron. More than half of the steel used in America requires scrap for its production. *You can help.* Turn your worn-out iron and steel into cash . . . help the steel mills turn it into steel products you need. Call your scrap metal dealer . . . move your scrap-pile immediately.

All Continental products are made from open hearth steel and are uniformly processed and finished according to the needs of their use. Increasing Continental production is "stepping up" shipments of steel sheets, wire, Chain Link fence, farm fence and roofing, etc. More scrap metal means even more Continental products for you.

CONTINENTAL STEEL

CONTINENTAL STEEL CORPORATION

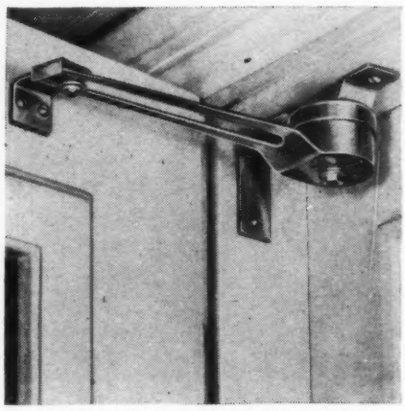
GENERAL OFFICES - KOKOMO, INDIANA

PRODUCERS OF STEEL SHEETS, including Continental GALVANIZED, COPPER-STEEL Galvanized, KONIK steel sheets Galvanized, UNIFORM SPANGLE Galvanized, DULL COAT, Continental GALVANNEALED, ELECTRICAL; Hot Rolled Pickled, and many styles of Formed Roofing. ALSO, Manufacturer's Wire in many sizes, shapes, tempers, and finishes; Continental Chain Link Fence, Nails, and other steel products.

automatic, controlled by a single push-button switch. In addition to welding, annealing, and flash dressing, an etching attachment provides a means of permanently identifying tools. Built for standard a.c. 220 - volt single - phase 50/60-cycle operation, the Model DBW-3A can be supplied for other voltage requirements. DoAll Co., 1301 Washington Ave. S., Minneapolis 4.

DOOR CONTROL

Positive closing action is claimed for door control. No periodic oiling or servicing is necessary, units are compact, and principle working parts are self-contained and sealed. A mechanical adjustment increases or lessens tension as



needed. Heat, cold, or moisture are said to have no effect on operating efficiency. Constructed of steel and cadmium plated, the control is made in standard and heavy-duty sizes. B. L. Mallory Co., 1201 East Eight Mile Rd., Hazel Park, Mich.

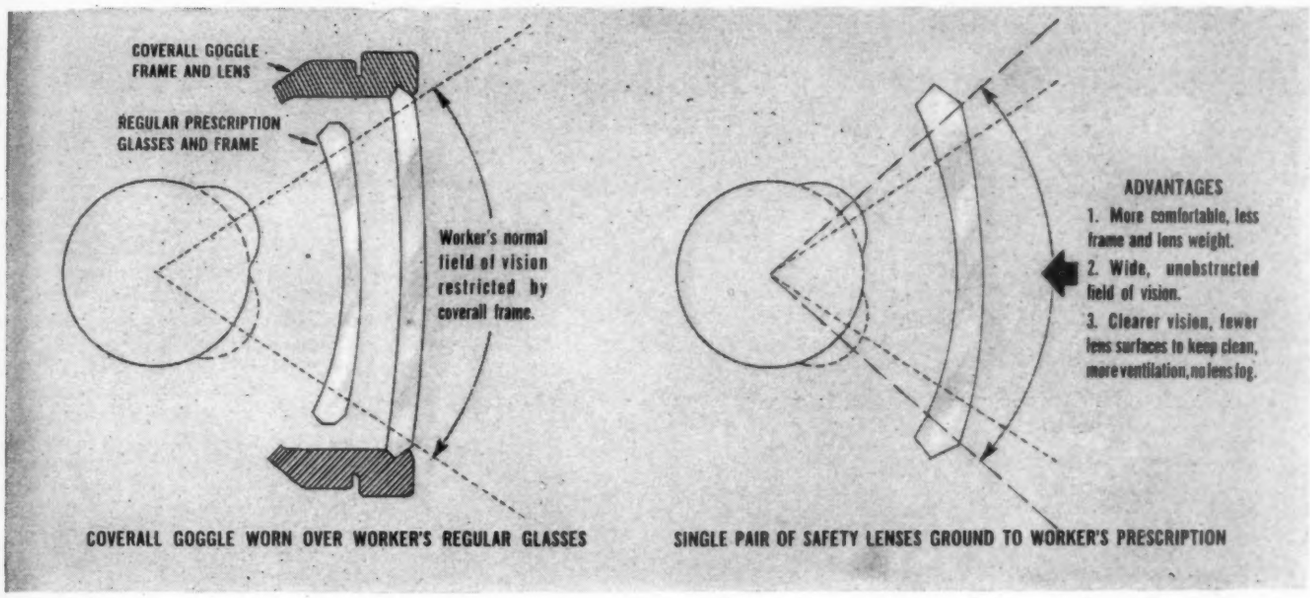
PAINT BRUSH CLEANER

Concentrate, known as Brush Shampoo, removes hardened paint, lacquer, varnish, shellac, or enamel from paint brushes. Cleaning down to the heel of the brush, it is said to be non-injurious to hog bristle or nylon, setting compound, or painter's hands. Brushes cleaned with the liquid can be rinsed under faucet without staining the wash basin. Packed in pint-size containers. Devoe & Raynolds Co., Inc., 44th St. & 1st Ave., New York 17.

VENTILATING HOSE

Lightweight spiral-wire reinforced hose and accessories, manufactured by the "continuous wind" process, supplement the "Flexaust" types used for ventilating, and for fume and dust control. Made with neoprene pre-coated fabrics in continuous hose lengths of any diameter from 1 to 24 inches. The hose is claimed to simplify any construction changes necessary to secure various degrees of flexibility, compressibility. crushing resistance, and other physical

How Prescription-Ground Safety Lenses Increase Workers' Efficiency . . . . .


COVERALL GOGGLE FRAME AND LENS
REGULAR PRESCRIPTION GLASSES AND FRAME
Worker's normal field of vision restricted by coverall frame.
ADVANTAGES
1. More comfortable, less frame and lens weight.
2. Wide, unobstructed field of vision.
3. Clearer vision, fewer lens surfaces to keep clean, more ventilation, no lens fog.
COVERALL GOGGLE WORN OVER WORKER'S REGULAR GLASSES
SINGLE PAIR OF SAFETY LENSES GROUND TO WORKER'S PRESCRIPTION

If you want increased production, improved quality, reduced labor turnover, fewer accidents, lower training costs, write for this booklet which describes the Ortho-Rater System of Visual Performance Tests, and other details of the Bausch & Lomb Industrial Vision Service.

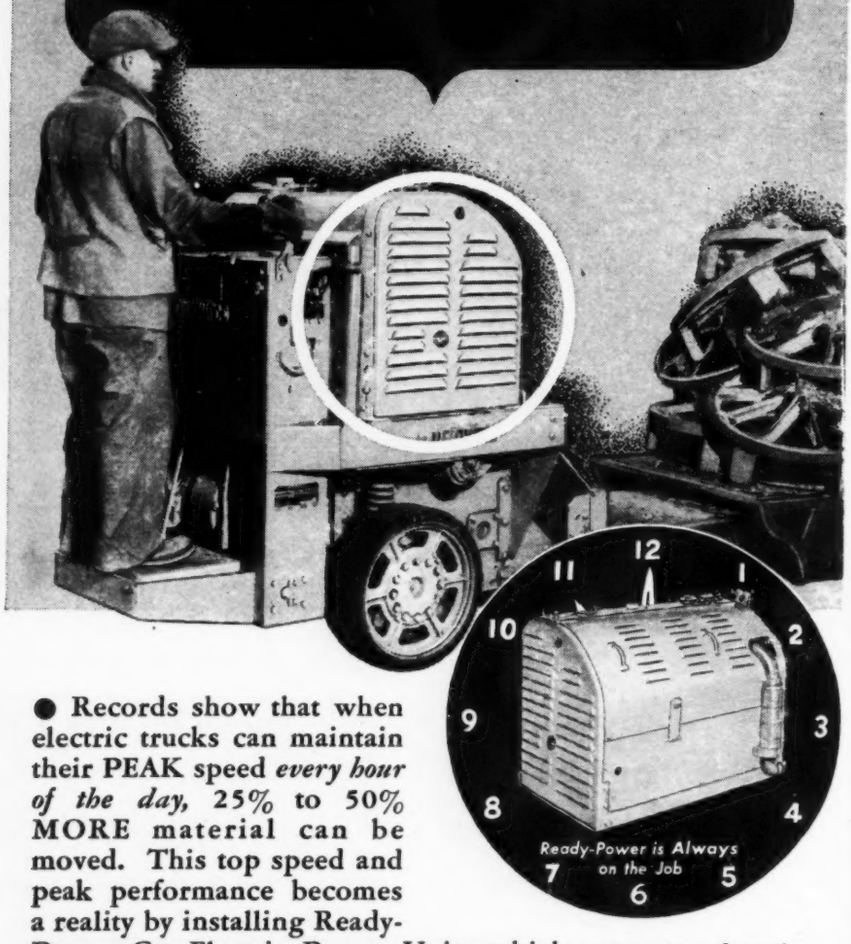
Modern industrial eyewear must provide *protection* and *correction.* In the Bausch & Lomb line of safety eyewear are models for protection against hazards of flying particles, glare, fumes, or dust. And with Bausch & Lomb Safety Lenses you can incorporate correction—professionally prescribed to the visual requirements of every job—to give workers the comfort and added earning power of top visual efficiency. Bausch & Lomb Optical Company, 650-11 St. Paul St., Rochester 2, N. Y.

BAUSCH & LOMB

ESTABLISHED 1853

with READY-POWER Electric Trucks Will Work at FULL SPEED

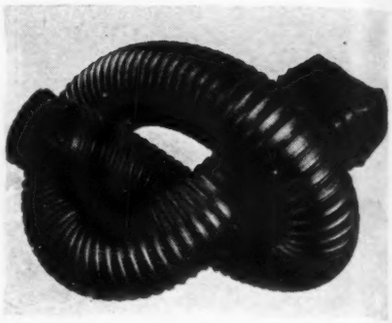
Every Day . . . All Day Long



● Records show that when electric trucks can maintain their PEAK speed *every hour of the day,* 25% to 50% MORE material can be moved. This top speed and peak performance becomes a reality by installing Ready-Power Gas-Electric Power Units which generate electric power right on the truck chassis. Thus your electric trucks are always ready to go . . . ready to work at top speed for unlimited hours. Ready-Power Units are sized to provide ample power for any job and they can be installed on any make truck. Reduce costs, save time and manpower by converting your present trucks to Ready-Power. Specify Ready-Power on new truck purchases.

THE READY-POWER CO.

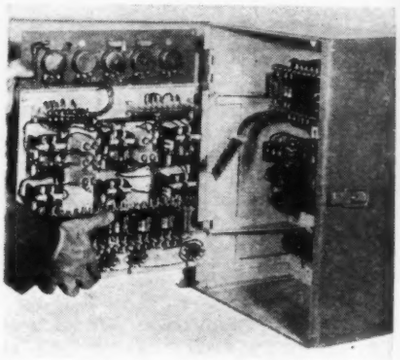
3820 Grand River Ave., Detroit 8, Michigan



characteristics. Cuffs, bushes, reducers, or flanges may be permanently attached to any of the hose lengths. American Ventilating Hose Co., 15 Park Row, New York 7.

WELDING TIMERS

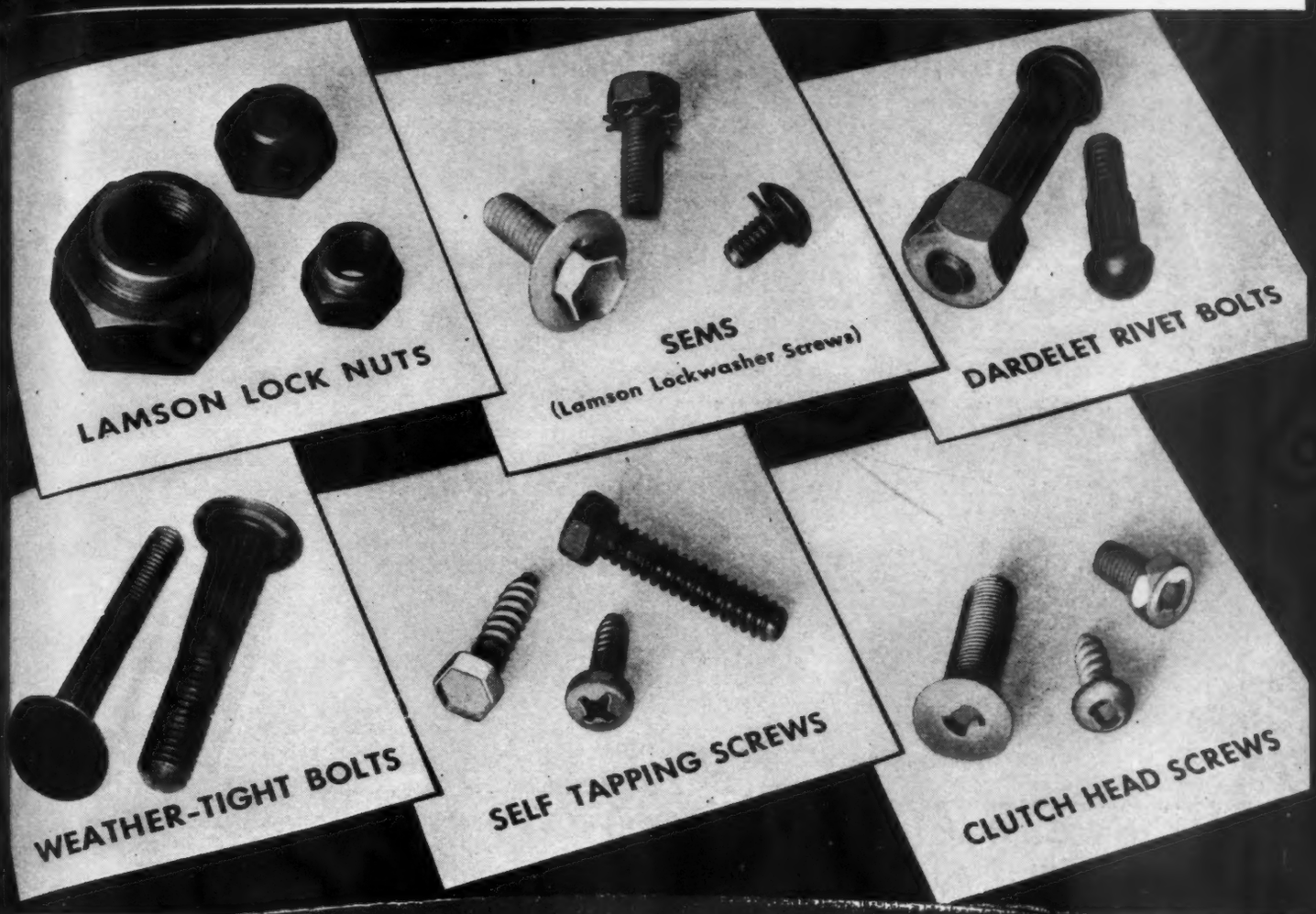
Design of sequence and sequence-weld timers for resistance welding permits quick change of welding sequence, easy inspection, and remote operation. The sequence timer coordinates the mechanical operation of an air or fluid-operated spot or projection welder with the flow of welding current, as determined by a synchronous-precision



weld timer. For less exacting applications, the sequence-weld timer provides the necessary control of both mechanical sequence of operation and non-synchronous control of weld time. Both can be used with standard control combinations in which ignitron contractors of synchronous-precision timers are used. Control Div., General Electric Co., Schenectady, N. Y.

COMBINATION VISE-DRILL

Portable vise-and-drill combination tool, named Twin-Tool, consists of two separate units used individually or in combination. One is a portable aluminum alloy vise which swings on a vertical axis, permitting turning to any angle. Equipped with detachable tool-steel jaw plates, the vise also includes two sets of integral pipe jaws to handle pipe from ⅜ to 5 inches. The second part of the unit is a portable drill which bites rapidly into metal without overheating or undue wear on the bit, maker states. Ratchet handle permits fractional turns



SIX FASTENINGS WHICH MUST SAVE TIME

—*every time they are used!*

Here are six standard fastenings which effect surprising results in speeding up assemblies—and all of them have set up production records for years past. Each one has a war record of its own—for saving time, when time was short. Each one of them now can be just as helpful in speeding up reconversion production. Just a little time saved, here and there, will determine who reaches the market first with a new product. And all six of these products have that one characteristic in common—*they save time.*

SEMS eliminate handling screw and washer separately. *That saves time.* Clutch Head screws reduce spoilage, drive straight the *first time.* Self-Tapping and Sheet Metal screws need no tapped holes—*drive fast* and hold tight. Lamson Lock Nuts of one-piece, all-metal design, make tight assemblies *stay tight.* Lamson Weather-tight bolts *need no counter-boring* in wood assemblies, set up faster, improve appearance. Lamson Dardelet Rivet-Bolts permit structural steel members to be fabricated and erected about *twice as fast* as can be done by any other means. All six of these products *are essentially time-savers*—and in reconversion—*time is money.*

There are few manufacturers who cannot use one or more of these six standard Lamson products with tangible advantages in cost reduction. Ask for complete information about all or any one of them.

THE LAMSON & SESSIONS COMPANY, 1971 W. 85th St., Cleveland 2, Ohio

Plants at Cleveland and Kent, Ohio; Chicago and Birmingham

—HERE'S A COUPON FOR YOUR CONVENIENCE—

THE LAMSON & SESSIONS COMPANY • 1971 West 85th Street • Cleveland 2, Ohio

Send information on ☐ Weather-tight Bolts ☐ Lamson Lock Nuts ☐ Lock-washer Screws ☐ Thrd. Forming Screws ☐ Dardelet Rivet-Bolts ☐ Clutch Head Screws

Name _____ Title or Kind of Work _____

Company _____

Street Address _____

City, Zone and State _____

TS AND NUTS · LAG SCREWS · SEMS · LOCK NUTS · CAP SCREWS · COTTERS · SET SCREWS · DARDELET RIVET BOLTS · KEY BOLTS

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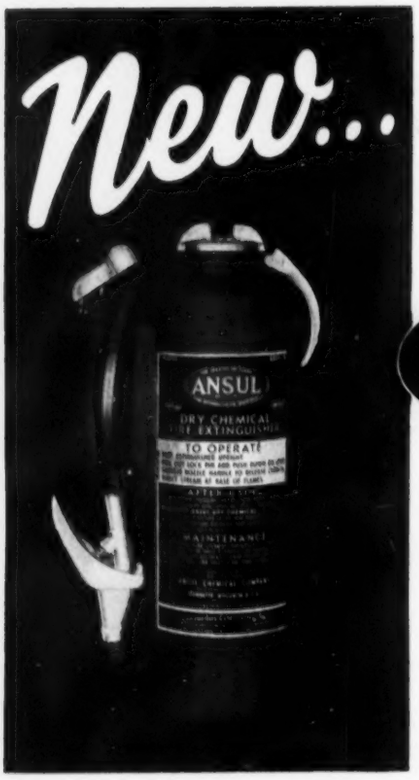
Ask your Jobber for the Lamson Line

DS · STOVE BOLTS · SHEET METAL SCREWS · WIRE ROPE CLIPS · PIPE PLUGS · WEATHER-TIGHT BOLTS · MACHINE SCREWS AND NUTS · SPECIALS



New... FASTER
FIRE STOPPING POWER
WITH

THE MASTER OF FLAME
ANSUL
FIRE EXTINGUISHING EQUIPMENT
duGas

DRY CHEMICAL
FIRE EXTINGUISHERS

Greatly increased fire-killing capacity.

Simplified operation.

Expert performance by inexperienced operators.

Quick, easier on-the-spot recharge after use.

More fire stopping power pound for pound, dollar for dollar.

Greater heat-shielding protection for operator.

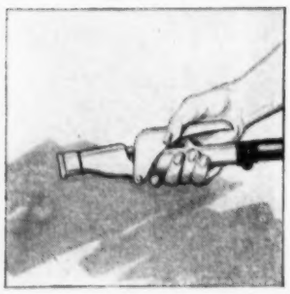
Increased fire-fighting capacity without increased weight.

Engineered to resist corrosion.

Install the NEW Ansul-Dugas Extinguishers at all hazard spots for greater protection against all fires involving flammable liquids, gases and electrical equipment.

Ready... in a Flash!

- Simply remove ringpin and push lever down.



- Open nozzle and direct chemical stream at base of flames.

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FIRE STOPPING POWER
with the NEW FASTER ACTING
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FIRE EXTINGUISHERS

Write today for new catalog and authoritative data showing characteristics of all types of approved hand fire extinguishers.

Listed and Approved by Underwriters' Laboratories and Factory Mutual Laboratories.

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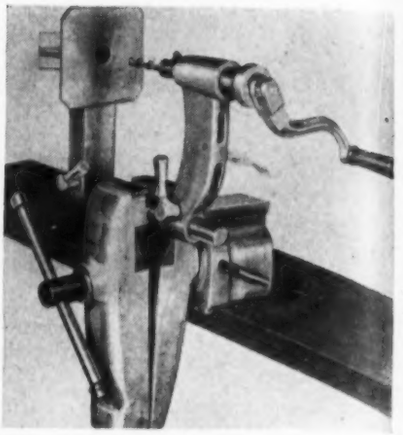
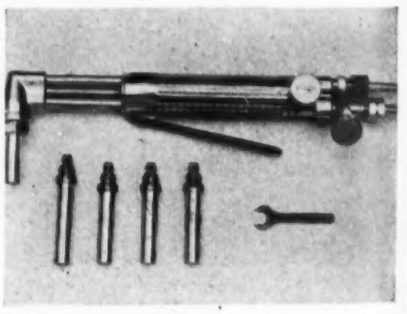


in tight places. Head and foot slide or lining bars in base to any position, and are locked by tension handles. W. H. Howland, 2533 East 73 St., Chicago 49.

SHORT CUTTING TORCH

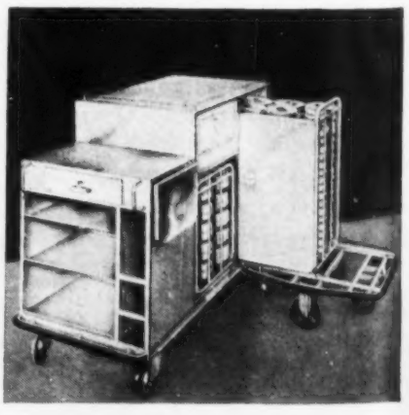
Developed to facilitate repair in the limited work space of fire tube boilers, oxyacetylene cutting torch has an overall length of 13 inches. The lever-type torch can be furnished with either a 45-, 75-, or 90-deg. bronze head. Made for

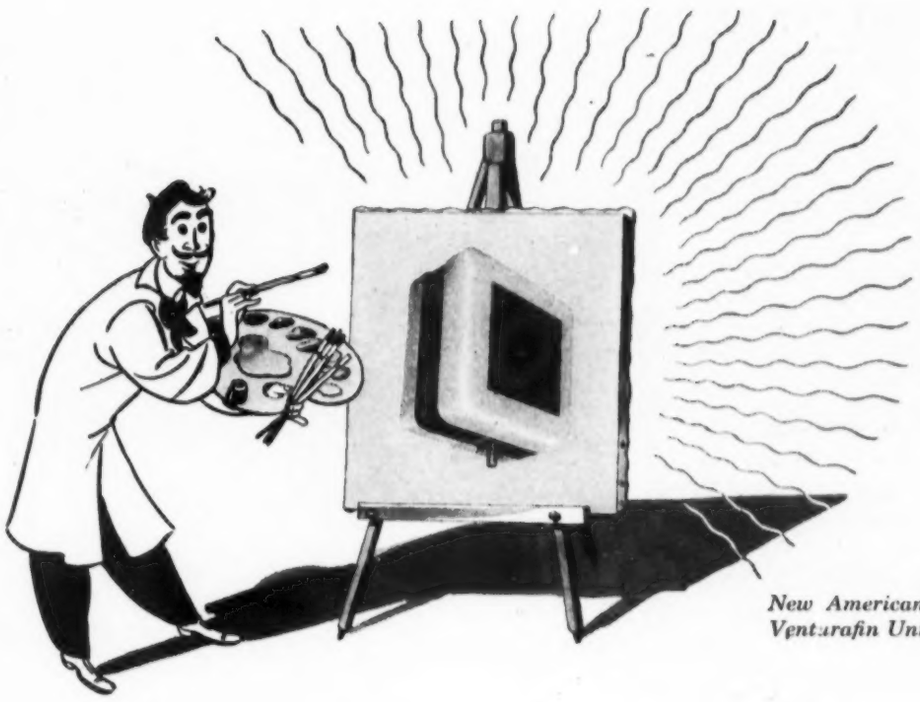


¼- and $\frac{5}{16}$-in. hose connections, the tool can also be used in removing worn tubes from heating boilers with low pressure process steam. Air Reduction Sales Co., 60 East 42 St., New York 17.

MOBILE FOOD CANTEEN

Food service cart, known as Mobile Canteen Model 83, provides for compact storage and simplified dispensing of individual hot meals for employees in in-





New American Blower Venturafin Unit Heater

We dolled up Industrial Unit Heaters!

For many years, industrial heating was both a "headache" and an "eyesore."

American Blower engineers cured the "headache" before the war by greatly increasing the range and efficiency of Unit Heaters, and eliminating needless noise in operation.

Now, we have greatly improved the appearance of industrial unit heaters—made them fit the architecture and environment of the most modern offices, factories, stores, garages, etc.

Phone your nearest American Blower Branch for information about the new, improved Unit Heaters for wall, floor or ceiling mounting. Ask also about any other air handling equipment you may require, and about Gyrol Fluid Drive for the smooth transmission of power or stepless variable speed control.

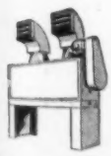
AMERICAN BLOWER

AMERICAN BLOWER

AMERICAN BLOWER CORP., DETROIT 32, MICH.

Division of American Radiator & Standard Sanitary Corporation

4 Years of War-Stimulated Improvement—On Top of 61 Years of Engineering Development



Heating Equipment

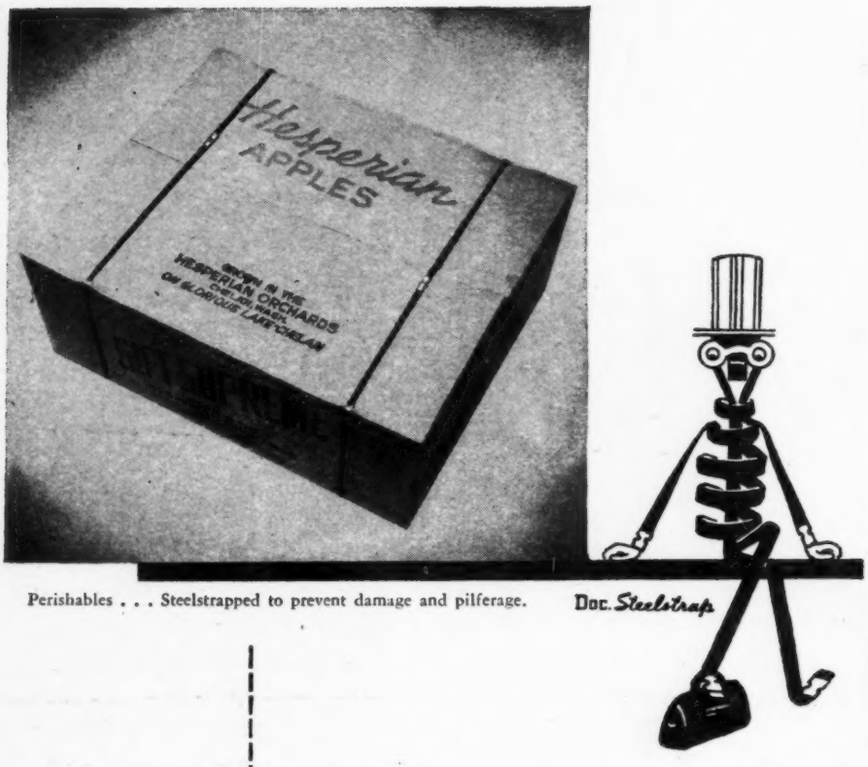
Ventilating Equipment

Gyrol Fluid Drive

Industrial Fans

Air Conditioners

Dust Collectors



Perishables . . . Steelstrapped to prevent damage and pilferage. Doc. Steelstrap

● Natural shipping hazards do not permit gentle handling of cargoes. But Acme Steelstrap protects your products from damage in transit — is security, too, against pilferage. Call in Acme to prevent shipping damage claims and pilferage losses.

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dustry. Complete luncheons or dinners may be served, including hot or chilled courses from pre-packed individual containers, salads, pastries, ice cream, hot coffee, cold milk, and soft drinks. Removable steel-wire racks display and dispense sandwiches, packaged salads, candies, fresh fruit, and so forth, and there is storage space under the racks. When fully provisioned each canteen serves 250 to 300 people. Mealpack Corp. of America, 152 West 42 St., New York.

OSCILLOGRAPH

Type 274 cathode-ray oscillograph can be used for routine laboratory and production testing, as well as for radio servicing. Equipped with Type 5BP1-A 5-in. tube, it is housed in a steel cabinet with plastic handle. The linear time-base

has a range of 8 to 30,000 c.p.s. Synchronization may be from the vertical amplifier or an external signal. Identical vertical and horizontal amplifiers have a range from 20 to 50,000 c.p.s., and provision is made for intensity modulation. Allen B. Du Mont Labs., Inc., 2 Main Ave., Passaic, N. J.

MAGNESIUM LADDER

Lightweight ladders said to last a lifetime are of all-welded magnesium construction. The 8-ft. ladder weighs 5½ pounds, while the weight of the 24-ft. extension ladder has been cut from 63 to 31 pounds. The rungs are welded into

Extreme Precision

Photograph courtesy HYTRON RADIO AND ELECTRONICS CORPORATION

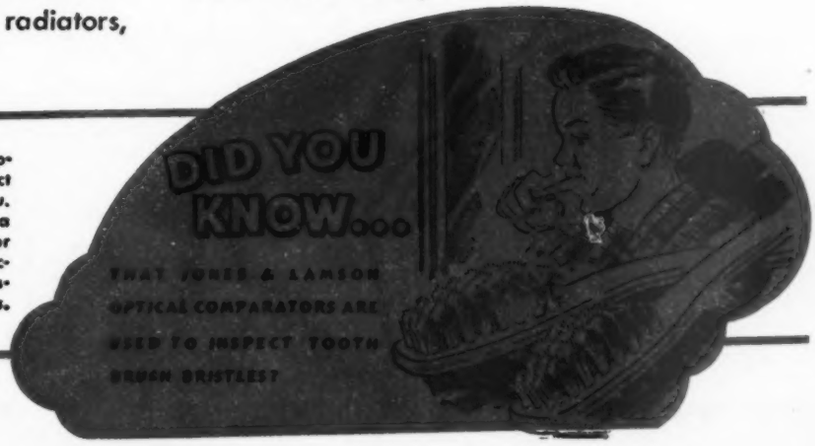
The extreme precision required in the manufacture of radio tube components demands exacting control. The most modern inspection methods must be used.

Jones & Lamson Optical Comparators are used to measure the dimensions and orientations of the punched holes in radio tube micas to tolerances of .0001", easily and rapidly. Many other components are also inspected by this method — plates, shields, leads, cathode sleeves, radiators, grids, and filament springs.

By any other method, inspection would be a slow and tedious business and the inspection department a costly bottleneck.

Our engineers are inspection specialists, their knowledge of holding fixtures, handling methods and suitable Comparator equipment has saved thousands of dollars in manufacturing plants throughout the country. Call, write or wire for their service today.

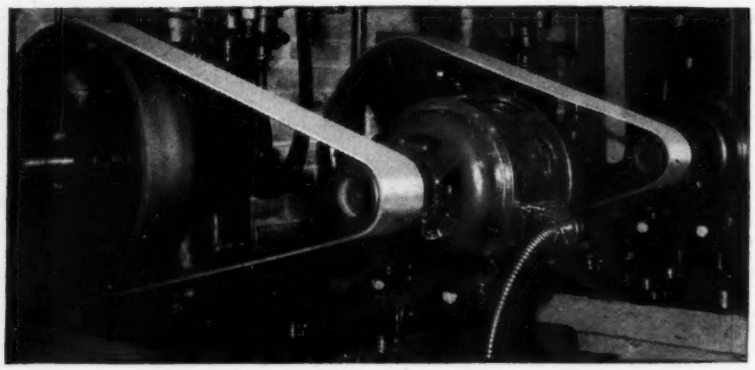
Probably a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection engineers to call and discuss your inspection problems.



JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

LONG SERVICE—LOW MAINTENANCE
MORE PRODUCTION



with TANNATE-ROCKWOOD ..... the short center drive that AUTOMATICALLY MAINTAINS CORRECT BELT TENSION!

Tannate-Rockwood pivoted motor base drives keep production at a steady, high rate even with fluctuations in load. If the load varies, the weight of the motor on the Rockwood pivoted base automatically adjusts the belt tension. The Tannate belt delivers full power to the machine even at peak loads.

Tannate leather belting has long service life and requires little maintenance. Prestretched and treated to resist moisture, machine oil and many chemicals, Tannate stays right on the job.

Tannate-Rockwood drives can give new vitality to old drives and keep new installations at peak efficiency. Why not give them a trial in your plant.

J. E. RHOADS & SONS
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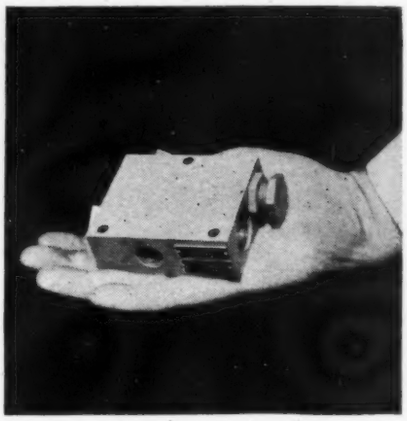
NEW YORK • CHICAGO • ATLANTA

RHOADS
Tannate-Rockwood
SHORT CENTER DRIVE

the side channels, and permanent strength, safety, and rigidity are additional features claimed for the ladders. All-metal construction prevents splintering and deterioration from weather exposure. The White Aircraft Corp., Palmer, Mass.

HYDRAULIC VALVE

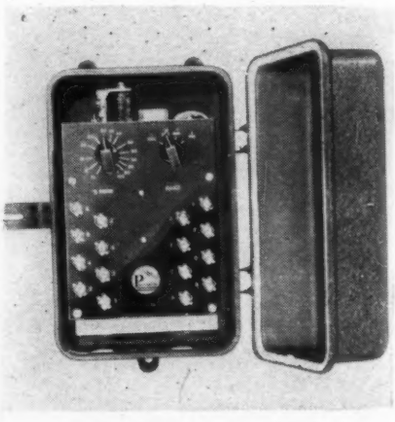
Positive seating, few moving parts, small size, long operating life, and low pressure drop are features claimed for hydraulic cutout valve. The housing, 1¼ inches deep, in plane form measures 2¾x3½ inches. All four ports—pressure, system, return, and bleed—are



in the same plane. Cut-out pressures can be supplied from 300 up to 1500 p.s.i., and the differential pressure can be varied from 75 to 500 p.s.i. An external adjustment for pressure setting is included. Made in the ball-and-seat, cone-and-seat, as well as the O-ring-and-flapper types. Electrol, Inc., 85 Grand St., Kingston, N. Y.

AUTOMATIC TIMERS

Electronic timer, Type 30HL1, suitable for process control and machine timing, automatically times intervals from 1/20-second to four minutes. Provides interval, delayed action, automatic repeat, and programming timing, as well as variations of these four types, in the one instrument, by changing external connections to the terminal board. A maxi-



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Heavy Duty Combination Cutting & Welding Outfit

Finest quality apparatus designed for general purpose operations. Cutting attachment built for quick, easy installation, and rapid changeover from cutting to welding. Constructed to stand up under continuous production service. This outfit is one of numerous cutting, welding and combination outfits now carried by your jobber as part of the Black Arrow line of Gas Cutting & Welding Apparatus.

Our only claim ... better flame

BLACK

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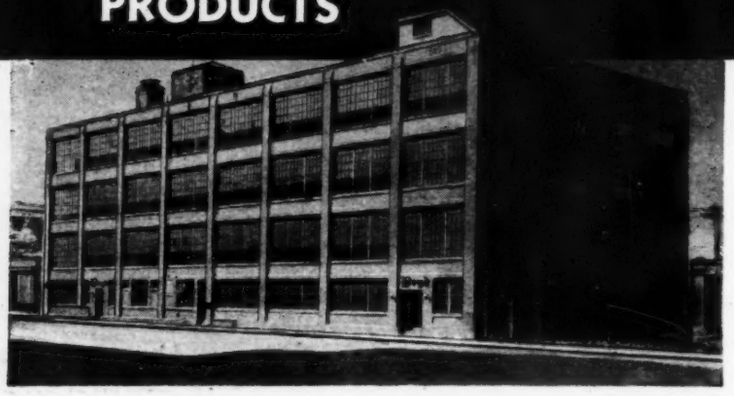
FORMERLY THE ALEXANDER MILBURN CO., PIONEERS IN GAS CUTTING AND WELDING APPARATUS SINCE 1907

The New Home of Lloyd PRODUCTS



Lloyd appreciates the patience and forbearance you have shown when overloaded manufacturing facilities slowed down delivery of Lloyd Flex-Loc Lamp Holders and Lloyd Automatic Starters. We are now at home in this large modern plant, where greatly increased facilities will make possible greater service to all our customers . . . service which we hope will match in quality the matchless Flex-Loc Lamp Holders and Lloyd Automatic Starters.

LLOYD POLICY INSURES QUALITY

651-F
FLEX-LOC Lamp Holder
Automatically self-adjusting. Engineered to fit ALL STANDARD spacings. POSITIVE AUTOMATIC LOCK. PERFECT ELECTRICAL CONTACT. Brass contacts grip BOTH sides of lamp pins securely.

Listed and Approved by Underwriters' Lab., Inc., and Canadian Standards Assoc., App. Division E.T.I. Test Report 314454 Available
Patented—Other patents pending

FS-40
AUTOMATIC Starter
CUTS OUT deactivated or flickering lamps. CUTS OUT current to lamp and ballast. Increases life of lamp and ballast.

Listed and Approved by Underwriters' Lab., Inc.
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LLOYD PRODUCTS CO.

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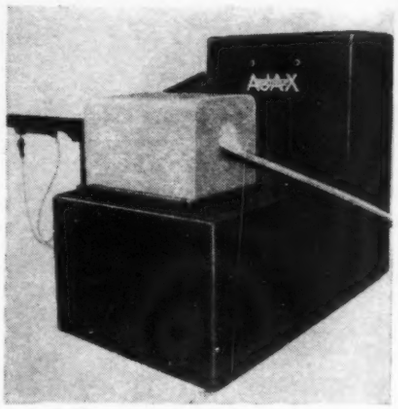
Branch Offices and Warehouse Stocks in 27 Leading Cities

mum time interval selector switch provides for 5 time intervals. Flexibility is obtained by bringing out many points of the circuit to terminals on the front panel. Basic circuit is self-compensating for changes in line voltage. Either 115- or 230-volt supply line may be used. Low line voltages do not affect operation. Photoswitch Inc., 77 Broadway, Cambridge 42, Mass.

INDUCTION HEATER

Continuous automatic heating of steel slugs or forging blanks prior to forging operations is the function of induction heater. The unit features an automatically timed pneumatic feeding device. Production rate from slugs 3⅜x1¾ inches is 350 per hour, each slug heated to about



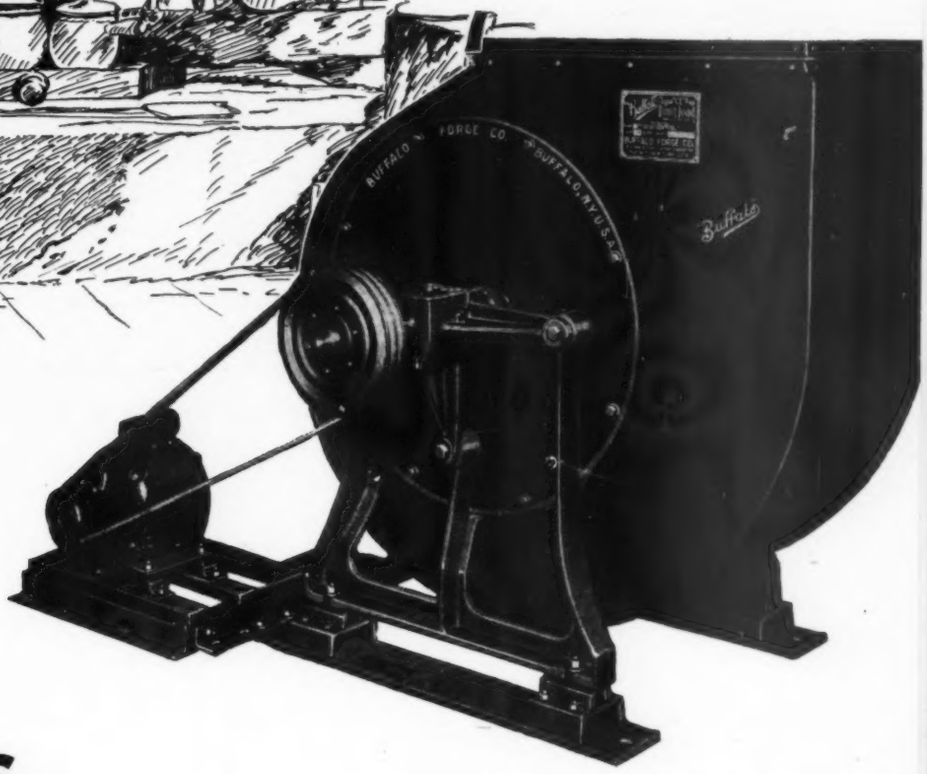
2200 deg. F. Power source is a 200-kw. motor-generator set, operating at about 1000 cycles per second. The heater can be converted from one job to another by changing the heating coil, resetting the timing device, and adjusting the feeding chute. Housing contains all capacitors and controls. Ajax Electrothermic Corp., Trenton 5, N. J.

DIAL INDICATORS

Master checking dial indicators, called the "Super," have over-all bezel diameters of 2¼ and 2¾ inches, and range of .008 inches, with the dial either balanced (4-0-4), or continuous (1-0-8). Bearings are jeweled. Low values of both internal friction (less than 10 grams) and

AIR FOR FOOD *in Old France*

● Fireplace bellows, picturesque air tools of another day, are still found in the quaint, spotless kitchens of Provence, southern France. Here, cooking is done in great open fireplaces, the wood fire being blown by the ancient bellows in this Provencale lady's capable hands.



MODERN INDUSTRY USES

"Buffalo" FANS

Buffalo "Limit Load" Fans are used for ventilating, exhaust service and air conditioning. This fan is mounted on a "Buffalo" Silent Floating Base.

Where Air Must be Handled "To Specifications"!

● Whatever your job for air, there's a "Buffalo" fan to handle it most *efficiently* under your conditions. Ventilating, blowing, exhausting, conveying and many other air uses are put on a *scientific* basis by our "Buffalo" engineers . . . who "tailor" each fan to your exact, required capacity . . . for *years* of economical, trouble-free service. The trained "Buffalo" representative in your city will gladly discuss your air problem with you at any time.

BUFFALO FORGE COMPANY

471 BROADWAY BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" first for fans

FANS FOR EVERY INDUSTRY

CM

68 Years of experience really means something

HOISTS

COMET light weight electric hoist. Capacities from ⅛th to 1 ton.

METEOR heavy-duty electric hoist. Capacities from ½ ton and up.

CYCLONE 12 bearing high speed hand hoist. Capacities from ¼th ton and up.

Since 1876 Chisholm-Moore has been providing industry with many types of overhead materials handling equipment. These years of experience combined with "service-thinking" engineering skill are reflected in the operating efficiency, durability, economy and safety features of all CM materials handling equipment... Hand Chain Hoists, Electric Hoists, Monorail Trolleys, Traveling Cranes, CM Puller (for horizontal pulling) and other CM equipment are fully illustrated and described in Catalog 1944. You'll find the information most helpful. Write us today for a copy.

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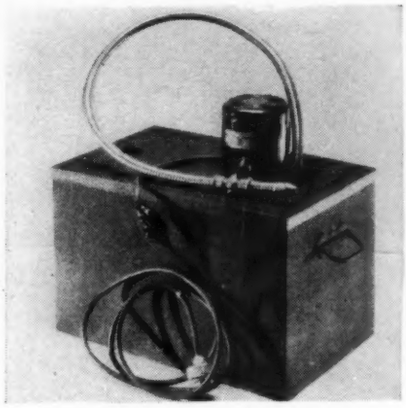
SALES OFFICES: New York, Chicago and Cleveland

contact pressure (50 grams) permit variations in dimensions down to .00001 inch. Practical readable accuracy is said to be .000025 inch. With a diamond contact, the indicators are adaptable as surface analyzers to check trueness and finish of ground surfaces, chatter of tools or work. A variety of backs, to suit the desired mounting, is available. B. C. Ames Co., Waltham 54, Mass.

COOLANT FILTERING SYSTEM

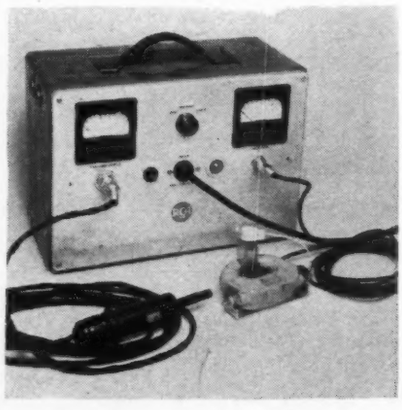
Self-contained filtering system removes fine metallic particles from coolants used on machine tools. The unit consists of a 7-gal. rectangular steel tank with a Strainco strainer which eliminates back pressure in coolant. Non-corrosive cen-

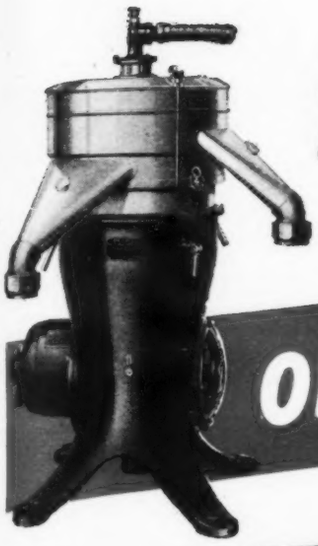


trifugal pump is mounted on lid of the tank, with the pump operating inside strainer. Provision is made for recirculating coolant liquid. The system is equipped with 4-ft. Wheelock flexible metallic hose and a bronze flow control cock, as well as wiring and switch. Inject-A-Flow Pump Co., 67 North Willow St., Montclair, N. J.

VACUUM GAGE

Vacuum measuring gage has been developed for operations requiring continuous and accurate measurements of reduced pressures down to 0.1 micron. Claimed to be virtually indestructible through the use of non-burnout elements, the instrument, known as Type EMG, is a portable unit for vacuum systems in which rotary pumps are used to





In both fields—

OIL PURIFICATION

PROCESS SEPARATION

De Laval Machines speed PRODUCTION

DE LAVAL Oil Purifiers and Industrial Separators remove solid impurities continuously and instantaneously. They likewise continuously separate and discharge two liquids of different specific gravities, not mutually soluble. Thus, De Laval machines greatly speed up production by substituting continuous flow for less efficient periodic settling.

It makes no difference whether the installation is in a metal-working plant or a process plant. In metal-working plants, the removal of dirt, metallic or abrasive particles from cutting oil, coolant or other factory oils by means of Oil Purifiers helps to maintain such oils in "like-new" condition. In process plants, Industrial Separators are the solution to a great many different types of problems of separation, clarification or concentration. And if the problem is one of three-way separation—continuous separation of two liquids plus simultaneous continuous removal of solids—the De Laval "Nozzle-Matic" will do the work at relatively high capacities.

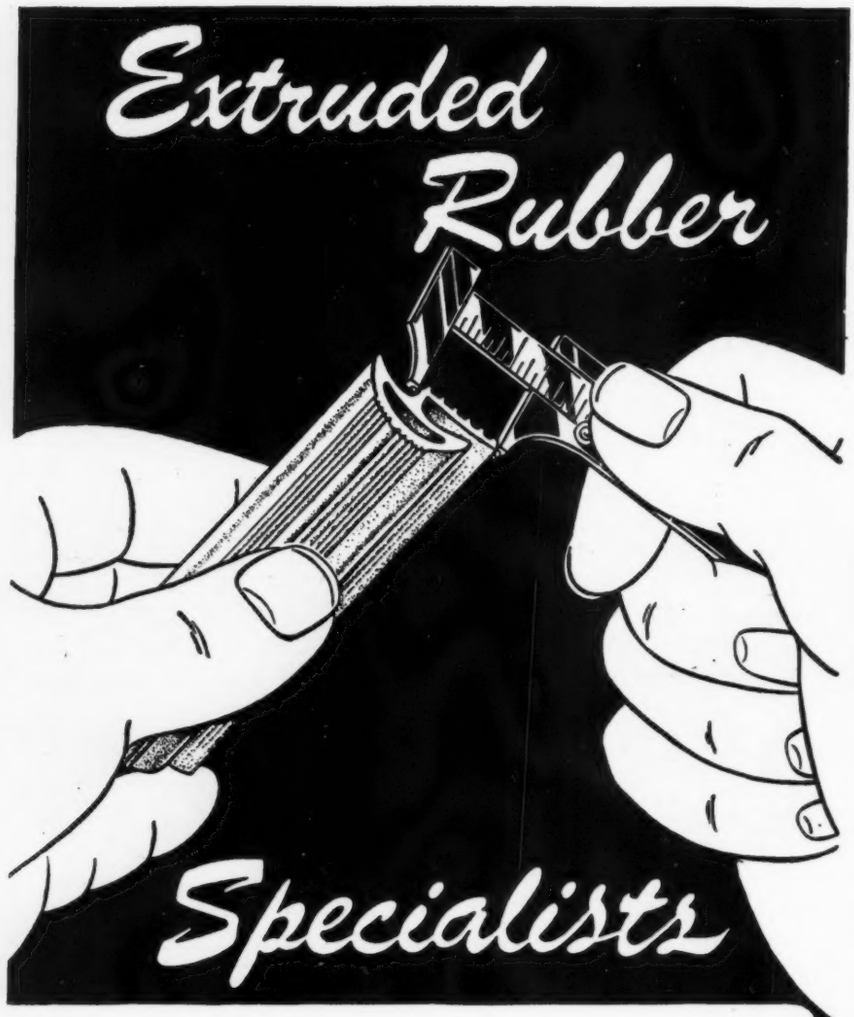
In writing for further details, specify whether you are most interested in separation, purification or clarification.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

INDUSTRIAL SEPARATORS AND OIL PURIFIERS

DE LAVAL

SAVE TIME AND INCREASE PRODUCTION



ACCURATE measurement is one of many essential requirements in the successful manufacture of extruded rubber. Careful selection of material, proper testing for physical properties, and skillful workmanship must also be incorporated in every step of the processing. Continental is fully qualified by forty years' experience to furnish extruded rubber products to meet your most exacting requirements.

Consult your nearby Continental branch.

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Buffalo, N. Y.	Detroit, Mich.	Lutz, Fla.	Rochester, N. Y.
Chicago, Ill.	Greensboro, N. C.	Memphis, Tenn.	St. Louis, Mo.
Cincinnati, Ohio	Hartford, Conn.	Milwaukee, Wis.	San Francisco, Cal.
Cleveland, Ohio	Indianapolis, Ind.	New York, N. Y.	Syracuse, N. Y.

★ *Continental also manufactures molded and lathe cut goods, as well as a complete line of hose, packing and other industrial maintenance items.*

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CONTINENTAL RUBBER WORKS
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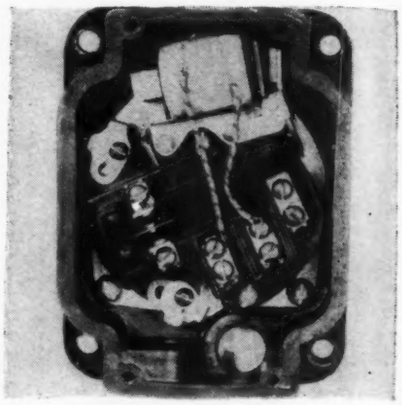
back oil diffusion pumps. The gage will continuously indicate the pressure while the mechanical pump is "rough" pumping, and shows the point at which the diffusion pump should be connected. Incorporates a thermocouple gage and a discharge gage, with standard pipe fitting. Scientific Instrument Section, Radio Corp. of America, RCA Victor Div., Camden, N. J.

PLUGGING SWITCHES

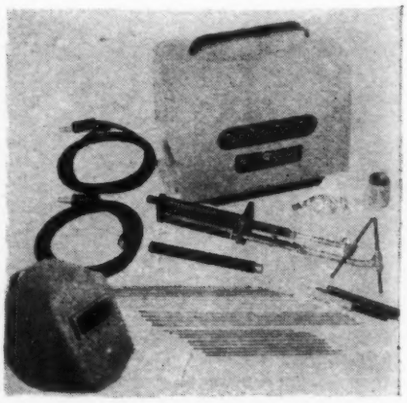
Oiltight, dustproof switches are designed to remove plugging power from a motor at the correct moment. Made in flange-



mounted and surface-mounted types Silver contacts handle directly the coil current of a 150-amp. contactor. Contact-operating speed can be adjusted. Maximum continuous-roating speed is 1800 r.p.m. Control Div., General Electric Co., Schenectady, N. Y.

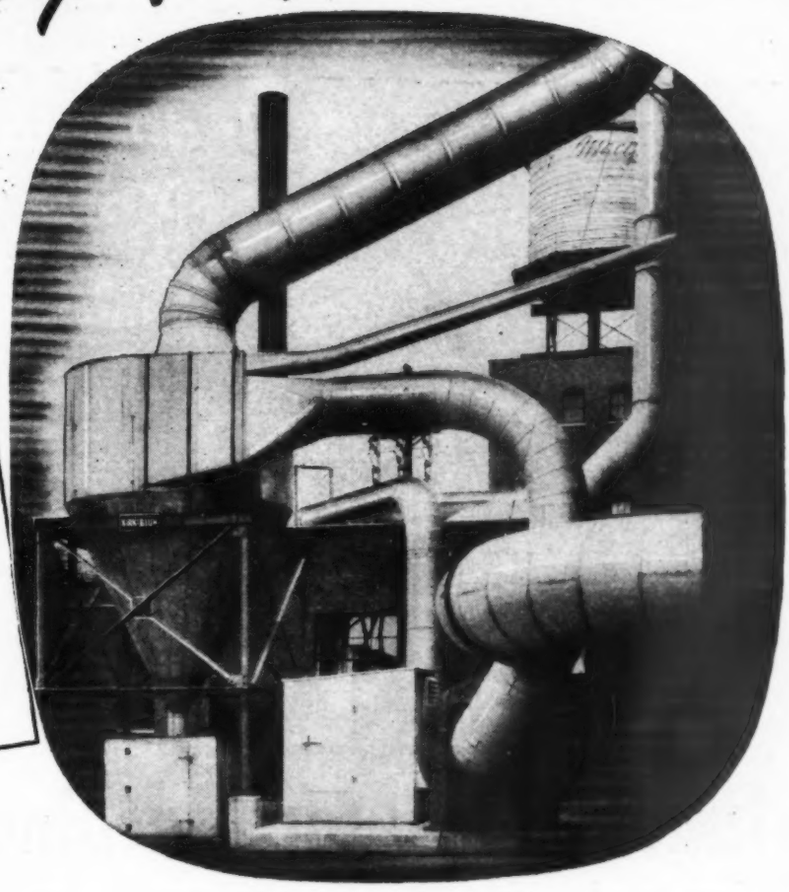
PORTABLE WELDER

Small, portable electric arc welder, named The Chief, is suitable for general light-duty applications. All accessories fit into a tray at the bottom of the heavy-gage metal case. The arc starts automatically, and adjustable electronic flame gives soft intense heat. Five heat stages are provided, with a working range up to 60 amperes, and operation is from 110-volt a.c. Helmet, heavy-duty cables with insulated taper plugs, insulated transformer, an electrode holder, ground clamp, aluminum and steel welding rods, bronze brazing rods, carbons, adaptors, and flux are included in



For Top Performance...

MacGregor SELECTS KIRK AND BLUM ENGINEERED DUST CONTROL



CRAIG WOOD, widely known professional golfer, watches with interest as a MacGregor Iron is precision ground to the exact weight required for "top performance."

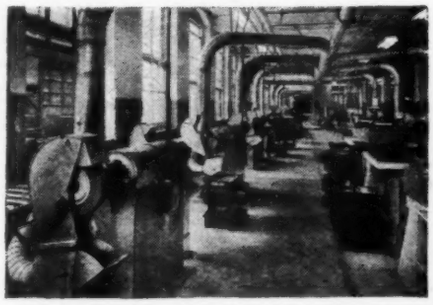
KIRK AND BLUM
ENGINEERED DUST CONTROL

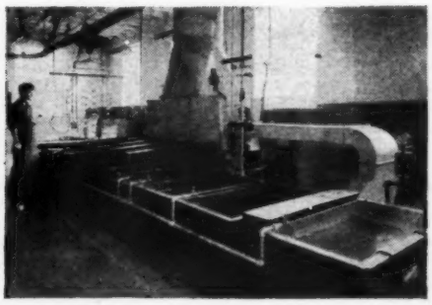
MacGregor—"The Greatest Name in Golf"—has achieved its reputation by a rigid, unvarying adherence to quality. In the production of golf clubs, MacGregor uses only the finest materials and equipment, plus scientifically correct design and expert craftsmanship.

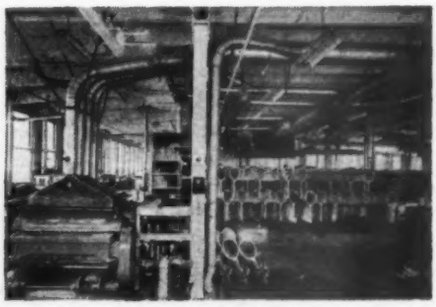
It was only natural that this recognized leader in its own field, should turn to Kirk & Blum for modern engineered dust and fume control.

Like all Kirk & Blum systems, the MacGregor installations are custom-built and fully engineered throughout . . . planned, designed, and installed to meet the particular needs of the individual plant. The result is guaranteed "top performance" maximum efficiency at minimum operating cost.

It will pay you to get the facts about Kirk & Blum Engineered Dust Control. For complete information, write: THE KIRK & BLUM MANUFACTURING CO.. 2835 Spring Grove Avenue, Cincinnati 25, Ohio.







Kirk & Blum Dust and Fume Control in grinding, plating and woodworking departments of MacGregor Golf, Inc., Cincinnati, Ohio.

*Tennant Floor Machines are available in various sizes for 8", 12" and 16" drum accessories. Motors up to 5 h.p. (elec.) or 6 h.p. (gasoline).

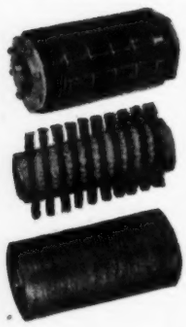
TENNANT

Industrial Floor Machine

When a powerful 6-horse* TENNANT Floor Machine bites into *any* kind of traffic-packed grime, it's pulverized and whisked up usually 6 to 8 times faster than by other methods such as hand scraping, air hammers or chemicals.

This performance makes it easy for ONE man to give you clean, smooth, fast-trucking floors in any department, regardless of type of grime. And the job leaves floors *dry* and can be done during working hours without interfering with plant operations.

Drum Accessories for Your Plant's Special Needs



REVO-TOOL—Unbeatable for high speed cleaning and leveling of heavy-industry floors, removing dried paint, cement splashes and similar grime. Ideal, too, for resurfacing. For steel mills, roundhouses, etc.

STEEL WIRE BRUSH—Revolves at 1725 RPM and shears grease, rubbery grime and metal cuttings from floors; leaves smooth, clean surface. For most factories and mills with wood block and concrete floors.

STEEL WOOL ROLL—The ideal drum accessory for fast dry-cleaning of stripwood floors in textile mills, precision instrument plants, tube factories, etc. ELIMINATES SCRUBBING; helps keep floor bright, smooth, wear-resistant.

WRITE FOR ILLUSTRATED BULLETIN 81. Contains on-the-job photos, typical benefits, descriptions of machines and other valuable information.

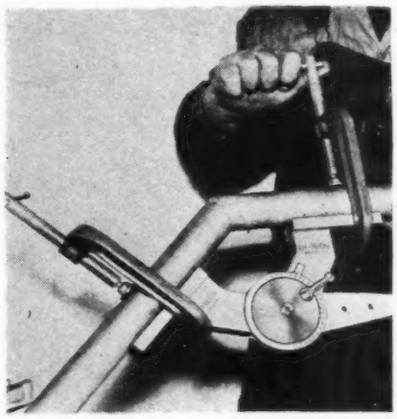
G. H. TENNANT CO.
2554 N. 2nd St., Minneapolis 11, Minn.

The way to finer floors
TENNANT
Floor Maintenance System

the case. Chicago Precision Machine Co., 922 South Michigan Ave., Chicago 5.

WORK CLAMPS

Duo-Square work holders clamp two parts, whether round or square bars, flats or angles, for welding, brazing, soldering, or cementing, without distortion, tapping, or squaring. Cast aluminum alloy brackets support two clamping faces that are either positioned at fixed angles, or adjustable to any angle, depending on the model. McFerron-



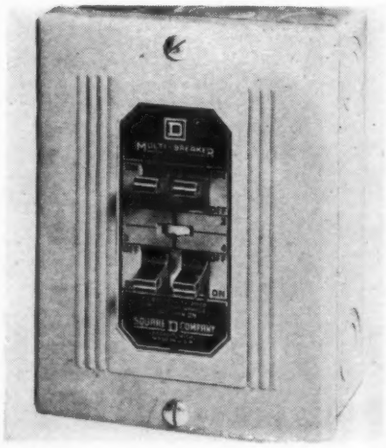
Myers Products Co., 308 Euclid Ave., Cleveland 14.

NIGHT LATCH

Latchbolt of Springlatch 040 is held back automatically when it is retracted by the key, permitting the withdrawal of the key and the unlatching of the door with the same hand. As door closes, latchbolt automatically springs out and locks the door. The case and strike are of a solid, rustless, die-cast, metal alloy said to have tensile strength of more than 40,000 p.s.i. "Mushroom" drivers in pintumbler cylinders prevent tampering. Additional protection is provided by recessed collar. The Yale & Towne Mfg. Co., 200 Henry St., Stamford, Conn.

CIRCUIT BREAKER

Four-circuit Multi-breaker MO-4 embodies thermal tripping, to carry start-



Chromy Says:

For Hard-to-Heat Applications

USE CHROMALOX *Electric* TUBULAR HEATERS

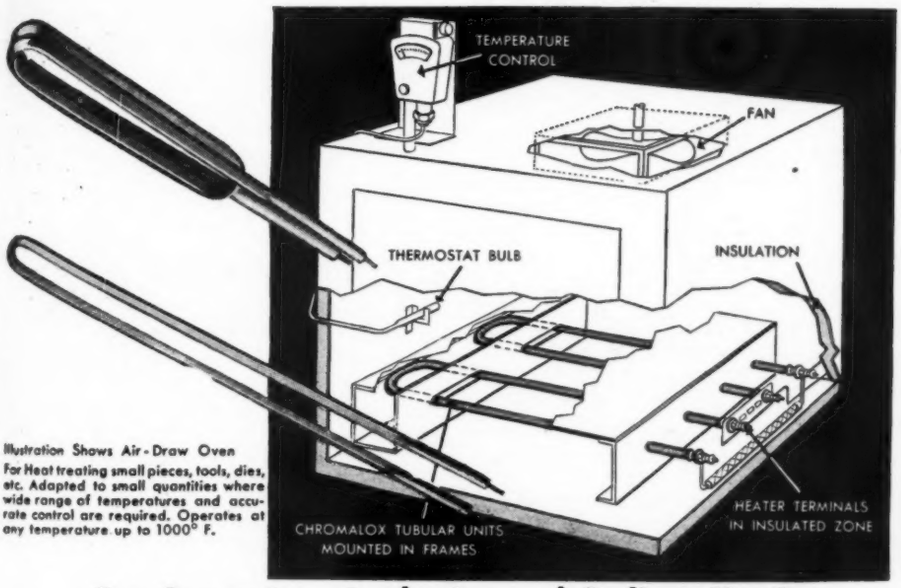


Illustration Shows Air-Draw Oven For Heat treating small pieces, tools, dies, etc. Adapted to small quantities where wide range of temperatures and accurate control are required. Operates at any temperature up to 1000° F.

For Convection, Conduction and Radiant Heating

Exclusive CHROMALOX Triangular cross-section assures fast, efficient and economical "around-the-clock" heat when and where you need it in your plant.

These *Electric* Heaters—bent and formed to your specifications—can be clamped to metal surfaces or inserted into machined grooves for heating platens, dies and molds. They can be supported by metal brackets for use as convection and radiant heaters. They can be used for soft-metal melting or immersed in liquids, greases or molten salts to make these materials free-flowing. CHROMALOX Tubular Heaters are easy to install and give trouble-free performance.

Investigate the full range of CHROMALOX *Electric* Heaters for use in *all* heating jobs in your plant. The CHROMALOX Application Engineer will gladly work with you.

EDWIN L. WIEGAND CO., 7518 THOMAS BLVD., PITTSBURGH 8, PA.

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Electric Heat for Modern Industry

Let us help you with your heating problems through CHROMALOX APPLICATION ENGINEERING SERVICE

If you are facing a heating job in your processing, production line, product, or plant . . . get in touch with the CHROMALOX Application Engineering Service.

CHROMALOX Application Engineers, located in 30 key cities, are ready to work with you on all your heating problems. These experienced men will show you how CHROMALOX *Electric* Heaters can be fitted into your operations. They have at their finger-tips specific data and correlated information on many types of industrial heating applications . . . and they can provide you with expert technical assistance, backed by years of engineering experience, to help you solve a wide range of heating problems.

No matter what use you make of heat in your plant, the odds are that CHROMALOX *Electric* Heaters can perform most of your heating functions more efficiently and more dependably at lower costs and less maintenance. Phone, wire or write today for details. No obligation.

FOR MORE INFORMATION

Send for your copy of *100 Ways to Apply Electric Heat* and *Catalog 42*. Both manuals contain a wealth of application ideas together with CHROMALOX products and data on *Electric* Heat.

Special markers for hot and cold steel, glass, cellophane, leather, rubber—markers that will do an *outstanding* job on any surface—are included in the Old Faithful line. They're precision made by marking engineers . . . the product of 111 years of manufacturing experience.

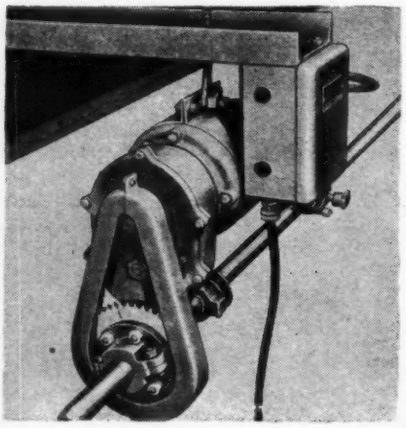
Send to Dept. F-16 for the FREE American Industrial Crayon Guide

THE AMERICAN CRAYON COMPANY
1706 HAYES AVENUE SANDUSKY, OHIO

ing and warming up loads of power and lighting circuits, and magnetic tripping action when heavy overloads or short circuits occur. Offers branch circuit capacities of 15, 20, and 30 amperes. Two single poles can be converted to a double pole for a 2- or 3-wire circuit. Available for flush or surface mounting, handle controls the three positions—"on," "off," and "tripped." Switch & Panel Div., Square D Co., 6000 Rivard St., Detroit.

CRANE MOTORIZATION

Providing electric power travel, the Travelator is now available in a universal mounting for any type hand-traveled overhead crane, single or double girder. The motor is held in a steel mounting



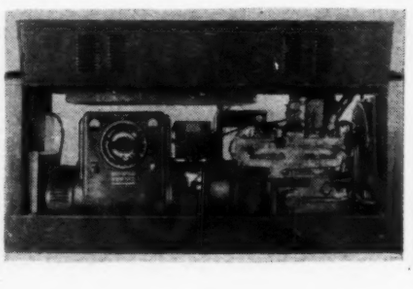
band connecting to the mounting bracket. Mounting band may be given any position about the periphery of the motor. Northern Engineering Works, 2615 Atwater St., Detroit 7.

LINE REGULATOR

Handling air and CO_2, Model 45 line regulator can be used to reduce tank pressure to a range of from 1 to 75 pounds. Made of solid forged and bar brass, with extra-heavy rubber diaphragm, and positive locking adjusting screw. Has a ¼-in. I.P.S. side inlet, and may be equipped with pressure gage by means of a simple "T". Rear inlet, ¼-in. I.P.S., may be obtained. Dockson Corp., 3839 Wabash Ave., Detroit.

WELDING MACHINE

Combination gas-electric-driven welding machine consists of standard 300-amp. generator and 20-hp. induction motor, mounted on a heavy solid shaft



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The *real* cost of floor finishing material is the service you get per dollar spent, not price per gallon. Prove to yourself that Continental "18" looks better, stays clean longer, and outwears any floor treatment you now use . . . yet costs no more . . . under this *guaranteed* plan for buying floor treatments.

Order Continental "18". Try it on your floors. *You* alone judge results. If cost of Continental "18" . . . excluding manpower saved . . . exceeds usual cost, difference refunded under *written* guarantee. For full information, write for FREE booklet.

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Shows You How One Piece of Equipment

- TRANSPORTS WORK
- ELEVATES WORK TO PRESS BED LEVEL
- POSITIONS WORK
- TRANSFERS WORK TO DIFFERENT LEVELS
- LOADS AND UNLOADS MOTOR TRUCKS
- SUPPORTS OVER-HANGING WORK

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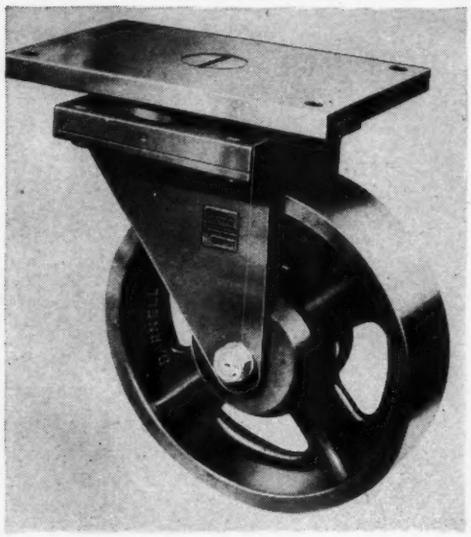

DARNELL CASTERS

Darnell Casters and Wheels assure the easy handling of heavy loads – savings in floor and equipment wear soon pay for their cost.

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FOR NEW DARNELL MANUAL

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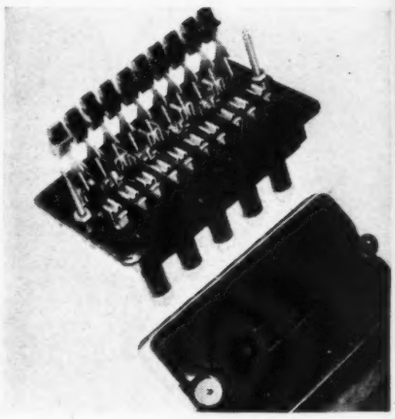
LONG BEACH 4, CALIFORNIA
60 WALKER ST., NEW YORK 13, N.Y.
36 N. CLINTON, CHICAGO 6, ILL.

coupled in positive drive to a Chrysler 6-cylinder industrial engine. When generator is driven by the motor instead of the engine, the clutch will automatically over-run. Motor is wound for dual voltage 220/440, and is started by a push-button across-line contactor. The gasoline engine is furnished with an idling device. The Hobart Bros. Co., Hobart Sq., Troy, Ohio.

TEST SWITCH

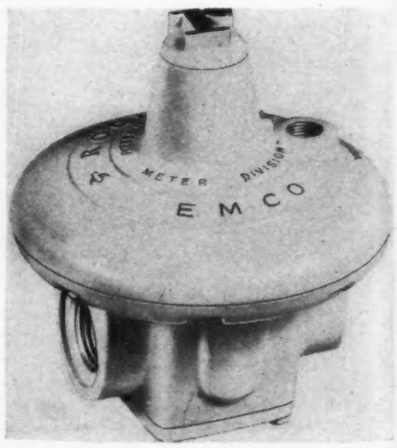
Switch has been constructed for testing switchboard instruments, meters, and relays from the front of the board. Including up to ten elements, and rated at 250 volts, 30 amperes, combinations of current and potential switches are included as required. Individual switches

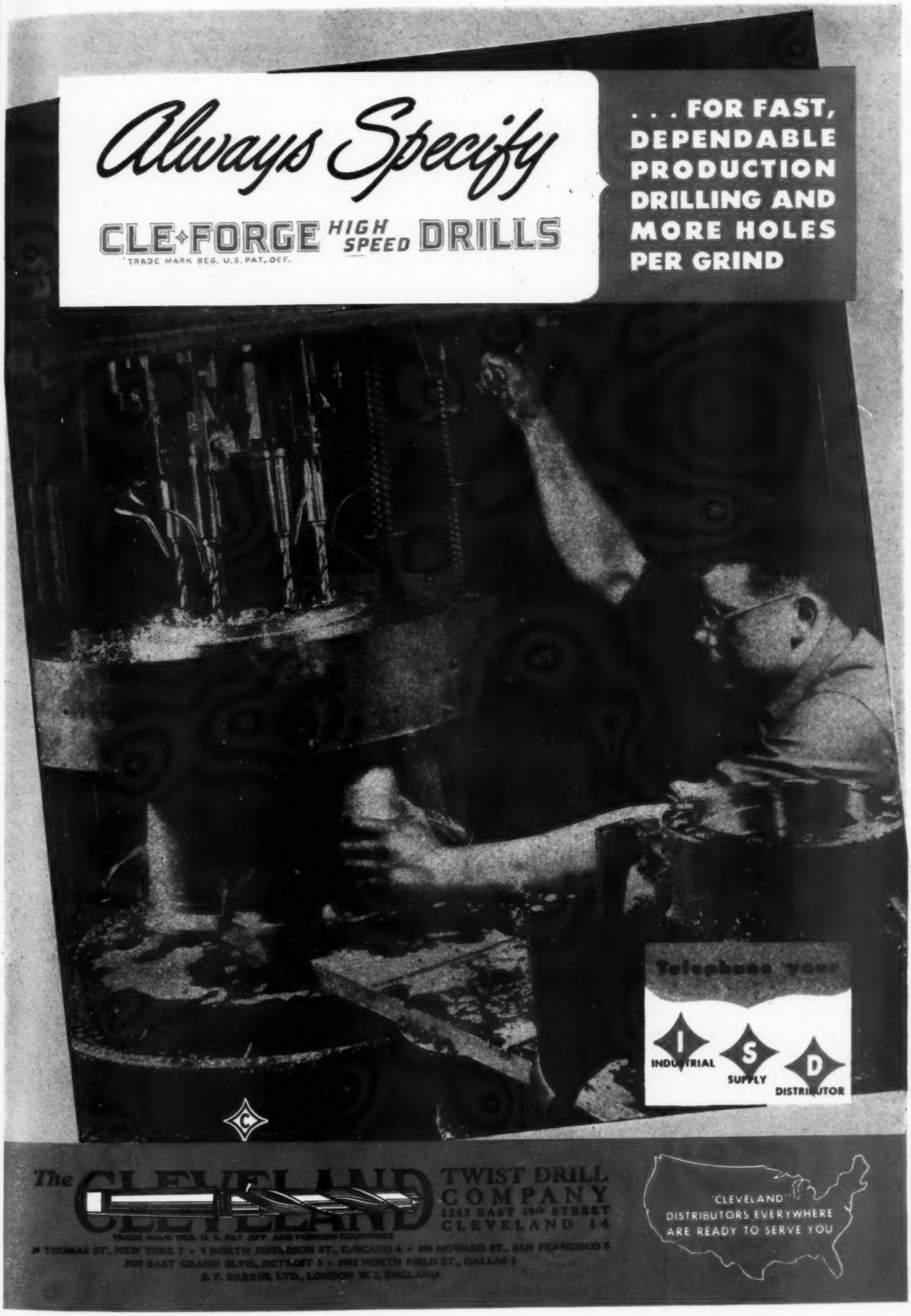


are of the knife blade type, separated by barriers. Moldarta switch handles are recessed for inserting indentification cards, and are drilled for insertion of an interlocking bar to tie together any three adjacent handles. Spring clips can be attached when individual test leads are used instead of a test plug. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

FUEL GAS REGULATORS

Series of appliance burner pressure single-valve regulators is made in sizes from ⅛ through 1¼ inches. The bodies and covers are pressure cast from an aluminum alloy. Areaways are large and smooth-walled, and valves and seats are

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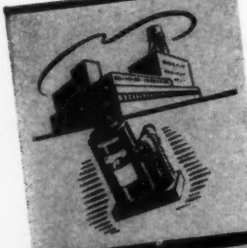
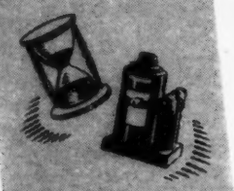
Important answers to factory problems



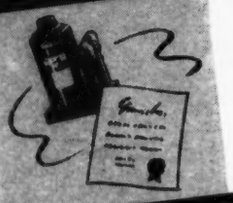
Q WHAT USES are made of Hein-Werner Hydraulic Jacks?

A 1001 USES including lifting, lowering or moving machinery and other heavy items, pressing bushings, bending or straightening rods.



Q HOW MUCH SAVINGS in TIME can be effected with use of H-W Jacks?

A 100% or MORE is not unusual, but varies with type of job. Specifically—one plant attached a H-W Jack to a 36" filter press with result *one* man closes press in less than 30 seconds whereas it previously took *two* men 3 to 5 minutes.



Q ARE H-W JACKS DEPENDABLE?

A YES, these sturdy hydraulic jacks are factory-tested at 1½ times rated capacity.

Q ARE JACKS AVAILABLE for factory needs?

A YES, H-W Jacks are being made in models of 3, 5, 8, 12, 20, 30 and 50 tons capacity.

The rugged construction and smooth, powerful operation built into Hein-Werner Jacks are prime reasons behind their ability to save time and labor throughout industry. There are no better jacks made than those developed and produced by Hein-Werner. For details consult your nearest industrial supply distributor, or write us.

Hein-Werner HYDRAULIC JACKS

BUILT RIGHT

PRICED RIGHT

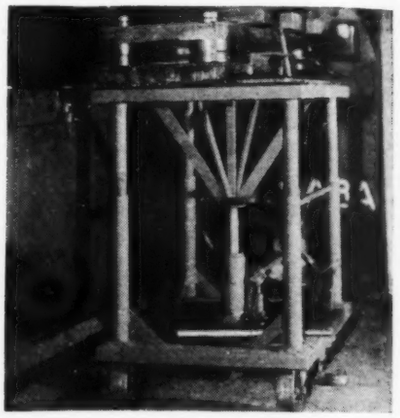
HEIN-WERNER MOTOR PARTS CORP.

Waukesha, Wisconsin

of maximum proportions. Diaphragm, valve chamber, and interior passageways are standardized in pipe size, pressure drop, and capacity. Pittsburgh Equitable Meter Div., Rockwell Mfg., Pittsburgh 8.

HYDRAULIC UTILITY TABLE

Designated Model No. 11067, hydraulic utility table handles heavy die sets. Load is raised by foot pedal to the height required. The table, rated at 2000 pounds



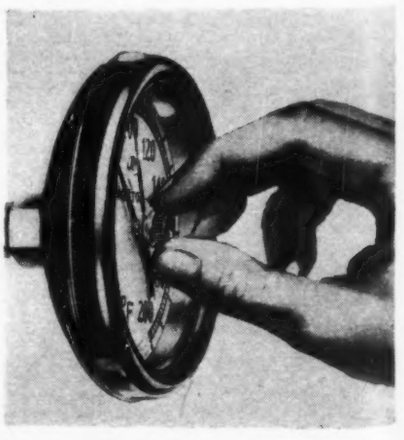
capacity, is mounted on 6-in.-dia. heavy-duty roller-bearing casters with a swivel arrangement. Foot-operated floor lock anchors the table to the job. Rack Engineering Co., 5102 Butler St., Pittsburgh 1.

RETAINING RING

Constructed in two interlocking parts, retaining ring is suitable for equipment involving high r.p.m. rates. Fitted over shaft, the ring forms an annular shoulder of uniform height around the circumference of the shaft, increasing the normal thrust capacity of the ring. Cannot be lifted out of its groove by high centrifugal forces or by linear expansion, according to the manufacturer. Waldes Koh-I-Noor, Inc., Long Island City 1, N. Y.

THERMOMETER

All-metal thermometer, known as the Max-Min, indicates the maximum or



ONE mark of the Bunting Authorized Distributor is ability to deliver. Bunting Precision Bronze Bars and Standard Stock Bearings are a part of his capital invested in your community. Try him.

The Bunting Brass & Bronze Company, Toledo 9, Ohio.

Branches in principal cities.

Bunting

BRONZE BEARINGS

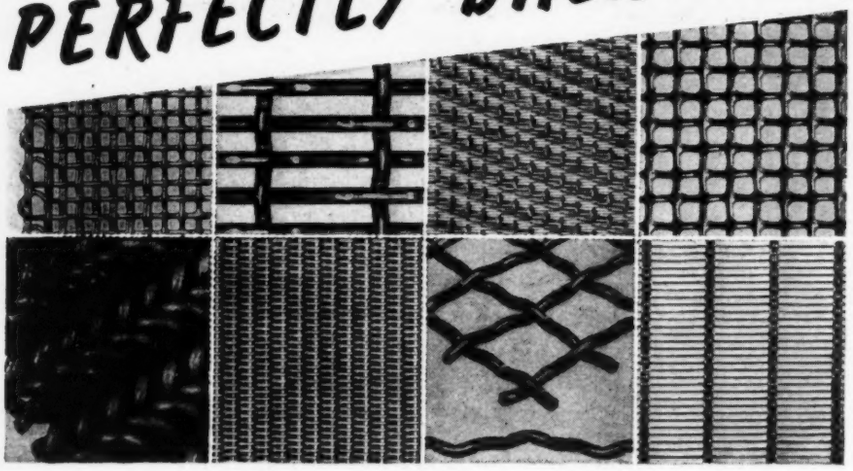
BUSHINGS

PRECISION BRONZE BARS

51

WIRE CLOTH COST AND SEPARATING SPEED

PERFECTLY BALANCED



To increase separating speed and lengthen your screen life, select a *higher quality alloy.*

Such alloys are woven by "Buffalo Wire." They permit you to go to a mesh of lighter gauge, and thereby achieve the perfect balance of productivity and screen life. The relatively higher cost of a durable alloy is more than offset by greater separating speed and less frequent wire cloth replacements.

NEW FOLDER 596

Tells how "Buffalo" Stainless Steel Wire Cloth cuts costs and improves performance in thousands of installations. Valuable data on corrosion-resistance. Write for your copy.

MANUFACTURER OF ALL KINDS OF WIRE CLOTH SINCE 1869

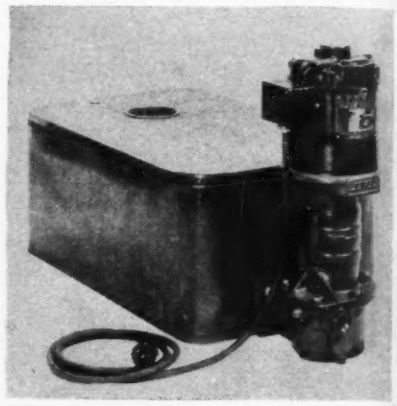
Buffalo WIRE WORKS CO., INC.

440 TERRACE BUFFALO 2, N. Y.

minimum temperatures reached on transformers, sterilizers, ovens, chemical, and other equipment, as well as in processing operations. An auxiliary red index is manually set by a knob protruding from the center of the scale glass to show the temperature required. It is made in models 221M and 222M, with scale diameters of 3 and 5 inches, and in stem lengths of from 2½ to 48 inches. Weston Electrical Instrument Corp., Newark, N. J.

COOLANT SYSTEM

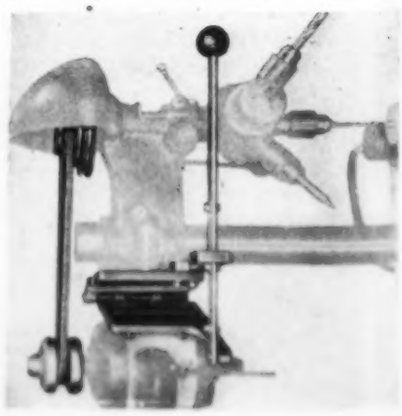
Flat machined flange on portable coolant pump permits use on most wet machine tools where a free flow of coolant is required. It has a capacity up to 30

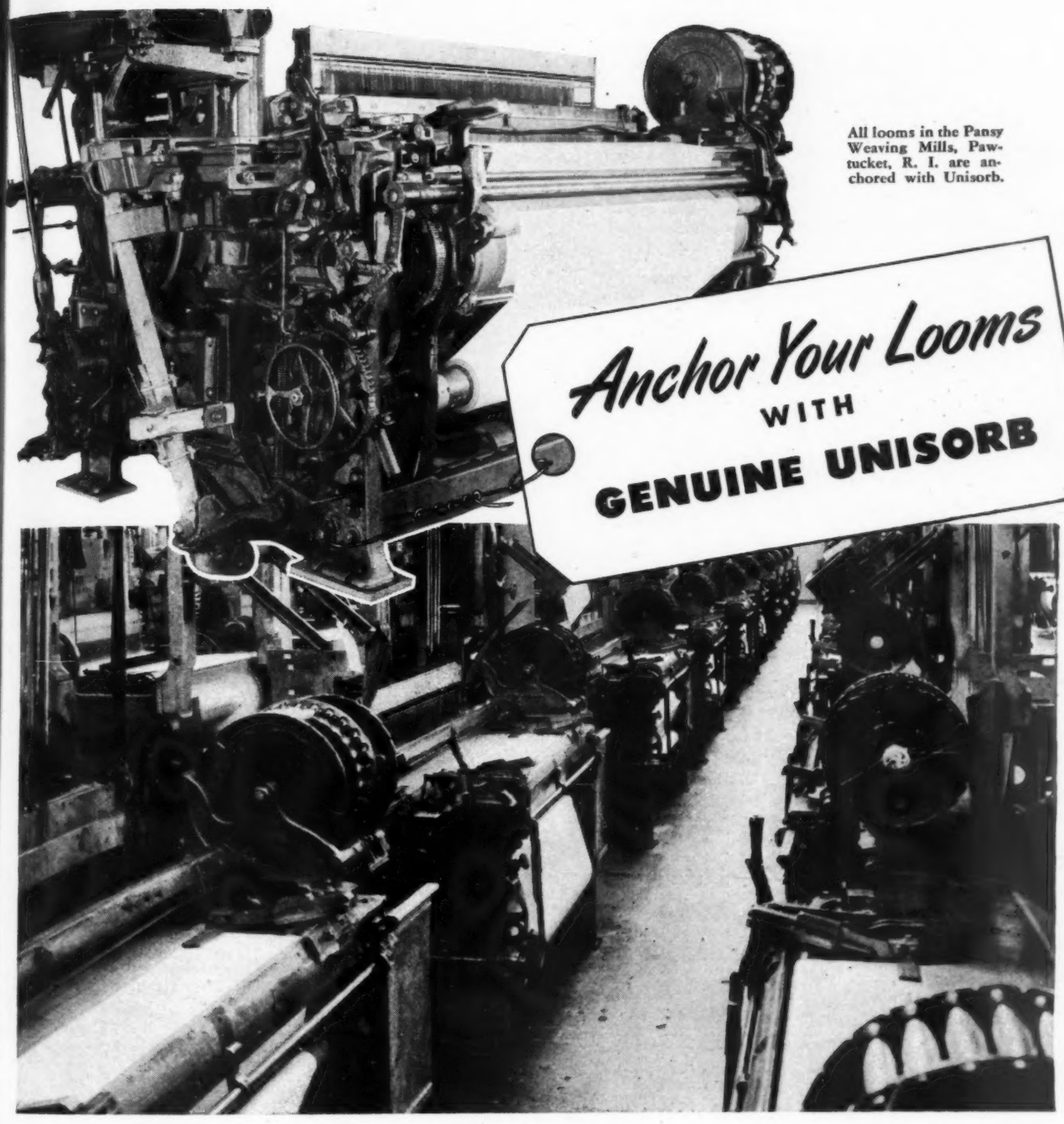


g.p.m. at low heads, and delivers water up to 2 g.p.m. to a 14-ft. head. The fully enclosed ¼-hp. motor has double-sealed, lifetime-lubricated ball bearings. Delta Mfg. Co., Div. of The Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1, Wis.

DRILL PRESS SPEED CHANGER

Instant Speed Changer is the name of a unit that adjusts drilling and tapping speeds on drill presses without need for changing belts or stopping motor. A lever sets the speed changer for any range of speeds desired. Standard 4-step cone V-belt pulley has a range from 435 to 4550 r.p.m. The unit is designed so that all steps of the pulley can be used. It can be installed on any drill press in a few





All looms in the Pansy Weaving Mills, Pawtucket, R. I. are anchored with Unisorb.

Anchor Your Looms WITH GENUINE UNISORB

AN EASY WAY TO LOWER LOOM MAINTENANCE COSTS

THE Pansy Weaving Mills of Pawtucket, R. I., has anchored all of its looms with Unisorb. Mr. N. Pansy says:

"We are extremely pleased with the results of this installation. We wondered at first whether Unisorb would hold looms to a concrete floor without lag screws, but find that it does the job satisfactorily. The vibration and shock of the looms have been reduced tremendously, and we are confident that our cost of machine maintenance will be greatly reduced. We highly recommend the use of Unisorb for all textile machinery installations."

The simple, quick, inexpensive way to anchor your looms is to cushion-mount them on Unisorb. A special cement securely binds the Unisorb to the machine feet and floor, and permanent set prevents any possible riding of the loom.

Send for samples and complete information.

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Hillyard Floor Treatments SAVE all types of floors in every type of Institution . . . they are Uniform, Dependable, and Economical, and bring out the natural beauty of every type of floor.

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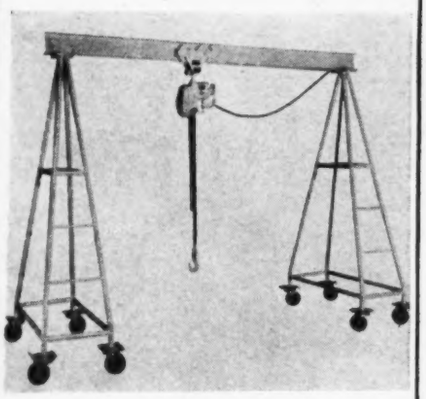
minutes with no alterations to the press, use of right speed for each tool prevents breakage. Chicago Drillet Corp., 1729 North Winchester Ave., Chicago 22.

PORTABLE GANTRY HOIST

Made of rigid, all-welded tubular steel, portable gantry hoist, available in 8-, 9-, and 10-ft. sizes, has a lifting capacity of



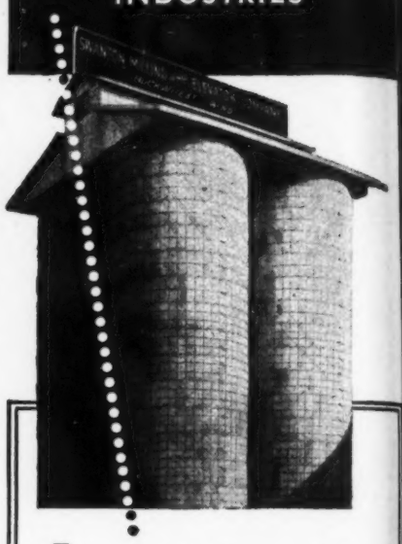
6000 pounds at the maximum span. Each standard is equipped with four heavy-duty ball-bearing swivel casters. The "I" beam is bolted to the top of each standard of the hoist to provide safe operation. Useful in machine shops, foundries, factories, quarries, and other industries. LaRay Engineering & Equipment Co., 1029 North 7 St., Milwaukee 3.

FIRE-FIGHTING NOZZLE

Known as Airfoam-Generating Nozzle, fire-fighting nozzle can be operated for either a foam stream or clear water stream. Suitable for extinguishing fires in flammable oils, paints, and varnishes,

it mechanically mixes water, air, and Airfoam liquid in the nozzle, discharging the combined ingredients as air foam. Nozzle is 2½ inches in diameter at widest part. Said to be fast in action, and easy to work. American-La-France-Foamite Corp., Elmira, N. Y.

NEFF & FRY STORAGE BINS NOW SERVE MANY INDUSTRIES



THEY handle successfully any and all bulk materials that will flow, to-wit:

Alumina	*Gravel*
Cement	*Kaolin*
Cinders	*Lime*
Coal	*Limestone*
Coke	*Magnesium*
Clay	*Mortar*
Cotton Seed	*Sand*
Ensilage	*Sawdust*
Fertilizer	*Soy Beans*
Foundry Sand	*Wood Pulp*
Grain	*Water, etc.*

The success of Neff & Fry storage equipment elsewhere entitles it to consideration for your plant. Super-concrete stave type—or monolithic. Any size. Trained erection crews. Liberal written guarantee.

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SUPER-CONCRETE PATENTED STAVE
BINS

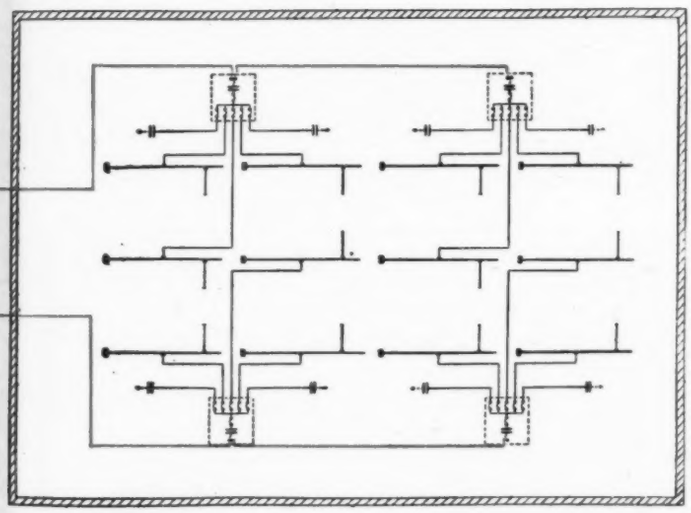
Substations *

They extend the "buy it complete" trend to applications requiring steelwork and master unit substations—with ratings from 750 to 45,000 kva; 11 to 69 kv, incoming, and 2.4 to 13.8 kv, outgoing

Here are the new G-E package substations! Clean-cut in design, complete to the last bolt of the steel structure—as compact and fully co-ordinated as modern engineering can make them.

These new package substations now extend to all outdoor substation applications the quick-ordering, time-saving, easy installation advantages so successfully introduced by General Electric's master and load-center unit substations.

The package substations you see here are just a few of the hundreds of standard combinations of the equipment listed on the opposite page. You can order a package substation that exactly fills your functional requirements and forms an integral, *flexible* part of your plant's existing, or planned load center power distribution system. It arrives at your plant complete with steel structure and *all* necessary electric equipment—a fully co-ordinated, ready-to-install unit.



One line diagram showing how new package substation dovetails with load center system in industrial plants.

HERE ARE THE TIME-SAVING MONEY-SAVING ADVANTAGES OF G-E PACKAGE SUBSTATIONS

1. Out-of-the-catalog ordering.

There are hundreds of standard G-E package substation combinations. You'll likely find the basic combination that fits your needs in GEA-4500 (described below). It's then surprisingly easy, you'll find, to order a package substation with the functions, ratings, circuits and physical arrangement to exactly match your specific needs. *One specification* and *one order* complete the job—at a fraction of the cost in time and dollars usually required to plan and order the substation in the conventional way.

2. Quick, easy installation.

Your package substation arrives in factory-assembled sections as large as shipping and handling facilities permit. It includes everything you need—right down to complete erection instructions—so that you can put the entire substation on the job quickly, easily, and economically.

3. Flexibility for future needs.

Centralized design of G-E package substations permits exceptional flexibility to meet changing plant power requirements. Capacity can be added—or removed—at little cost and in easily handled "blocks of power" to take care of increased power requirements, load shifts, or relocations.

Look into these inherent economies of G.E.'s new package substations, in terms of your next specific application. We believe you'll be pleased with the over-all savings it offers you. General Electric sales representatives will gladly work with you on any substation application you may have in mind. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Ask for a copy of GEA-4500. This new 78-page bulletin illustrates 30 standard classes of package substations, gives you helpful application information on each and shows you just how each will look installed. Your G-E sales representative can provide a copy or write to Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

***FOR BETTER SCHEDULING OF DELIVERIES*—Consult us early. A package substation matched to your needs can be ordered promptly, saving you months of detailed planning—moving up your delivery schedule.**

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"Yes. Heat where you want it—"

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you want to know

more about the items on this page

Letters to the addresses given below will bring you further information

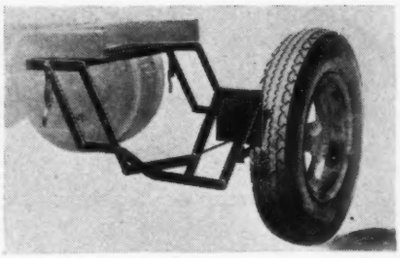
ELECTRONIC STOPWATCH makes possible high-speed counting operations and five-decimal-place accuracy in split-second timing. RCA Victor Division, Radio Corporation of America, Camden, N. J.

SURFACE FINISH STANDARDS, pocket set, affords convenient means of checking surface finishes; conforms to "preferred number" standards adapted by ASA. University Machine Company, Division of Baird Associates, Cambridge, Mass.

PORTABLE BAG CLOSER operates by friction drive without motor or electric power; sews bags shut. Richardson Scale Company, Clifton, N. J.

PROTECTIVE PACKAGING achieved by dipping item in plastic coating. Covering, it is said, protects fragile objects, precision instruments, from breakage, corrosion, other injuries. Seal-Peel, Inc., 903 Hammond Bldg., Detroit 26.

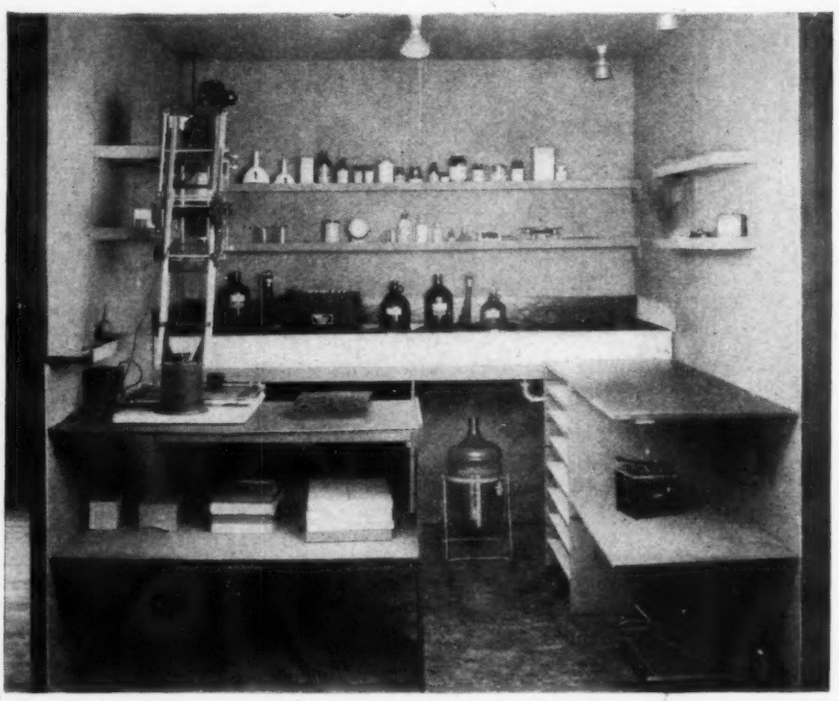
ALUMINUM ENGINE, gasoline, weighs 16 pounds. Delivers ¾ to 1 horsepower. Designed for use where light weight is important. Power Products Corporation, Grafton, Wis.



NO-LIFT TIRE CARRIER clamps to truck chassis. Folding frame does work of handling tire; permits one-man operation. T. E. D. Corporation, 928 S. Flower Street, Los Angeles 15.

EDUCATIONAL PAMPHLET of 60 pages, "Your Life in the Machine World," tells of development of many types of machines in terms of industrial progress, rising standard of living. Includes list of films and books. For free copies, write the author, L. A. Wilkie, The DoAll Company, Des Plaines, Ill.

FILM PRODUCTION supervision for industrial advertising or training, including distribution and utilization, is offered



PORTABLE DARKROOM of prefabricated construction occupies floor space 8x8 feet. Shipped or stored in 5 crates, can be assembled by one man in about 6 hours. All wiring and an air filter are built in. Alco Photo Supply Corporation, 15 West 47th St., New York

All Clear AFTER 9,000 HOURS

SUN DIESEL LUBRICANT...

Keeps Rings Free in Big Diesels for More than One Year of Continuous Operation

More than a year of continuous running, day and night . . . no stuck rings . . . no heavy sludge . . . no hard carbon . . . that's the record of a "Job-Proved" Sun Diesel lubricant in a big industrial power house.

The picture above shows a piston from one of the company's two 750-h.p., 6-cylinder, 4-cycle, Worthington Diesels after 9,000 hours of operation. The engine was shut down at this time only for routine inspection.

Performance like this is typical of the results being obtained by hundreds of Diesel operators in plants throughout the country, and in all types and sizes of Diesel.

Sun Diesel Lubricants have proved their ability on the job. They have extremely high resistance to heat, with minimum tendency to form gum or hard carbon. For continuous power output and low maintenance costs, call the Sun office near you today.

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The innate hunger for individual recognition smolders in the janitor as well as in the Chairman of the Board. To thousands of management men who are conscientiously searching for a workable relationship with labor, we have dedicated a new booklet, "Loyalty Is Built—Not Bought."

It is not a book for the chronic stuffed shirt. It discusses frankly and objectively the mistakes that are being made—the half truths that too often go unquestioned. More important—it charts a new course for the sincere and humane executive who knows that somewhere between despotism and coddling lies industrial harmony.

YOUR PERSONAL COPY of this important booklet will come to you by return mail when you write for it on your company letterhead. Please address Mr. George A. Bond.

GORDON B. MILLER and COMPANY
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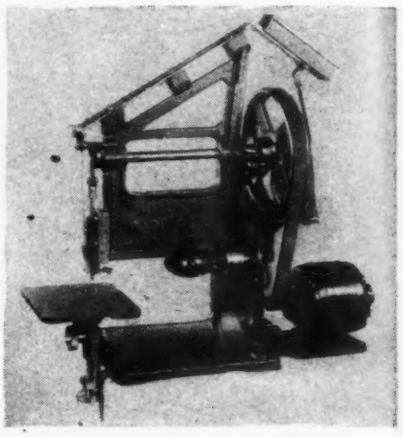
by Film Counselors, 336 Madison Ave., New York 17.

HOW TO ORGANIZE company libraries and files; also outside library research. Available through Jos. A. O'Connor & Co., Madison Ave., New York 17.



NAILING MACHINE for precision assembly drives small nails, pins, rivets, screws in wood, metals, plastics. Milliken Machine Company, Hastings Sales Engineering Division, Boston.

HUMAN RELATIONS approach through spiritual and psychological motivation is subject of pamphlet, "Management's Job Is To Manage." For copies, write to Chaplain Counselors for Industry, Inc., 1153 Broad St., Newark 5, N. J.

MOISTURE-DETECTING INK—for spraying, painting, printing on paper, cloth, metal—turns from blue to pink when moisture, dampness, or humidity approaches mold, rusting, warping stage. Eljay Enterprises, P. O. Box 891, Newark 1, N. J.

"JOBS IN INDUSTRIAL RELATIONS," booklet, describes some principal jobs in labor and management; analyzes requirements. For additional information write to the Industrial Relations Center, University of Minnesota, Minneapolis.

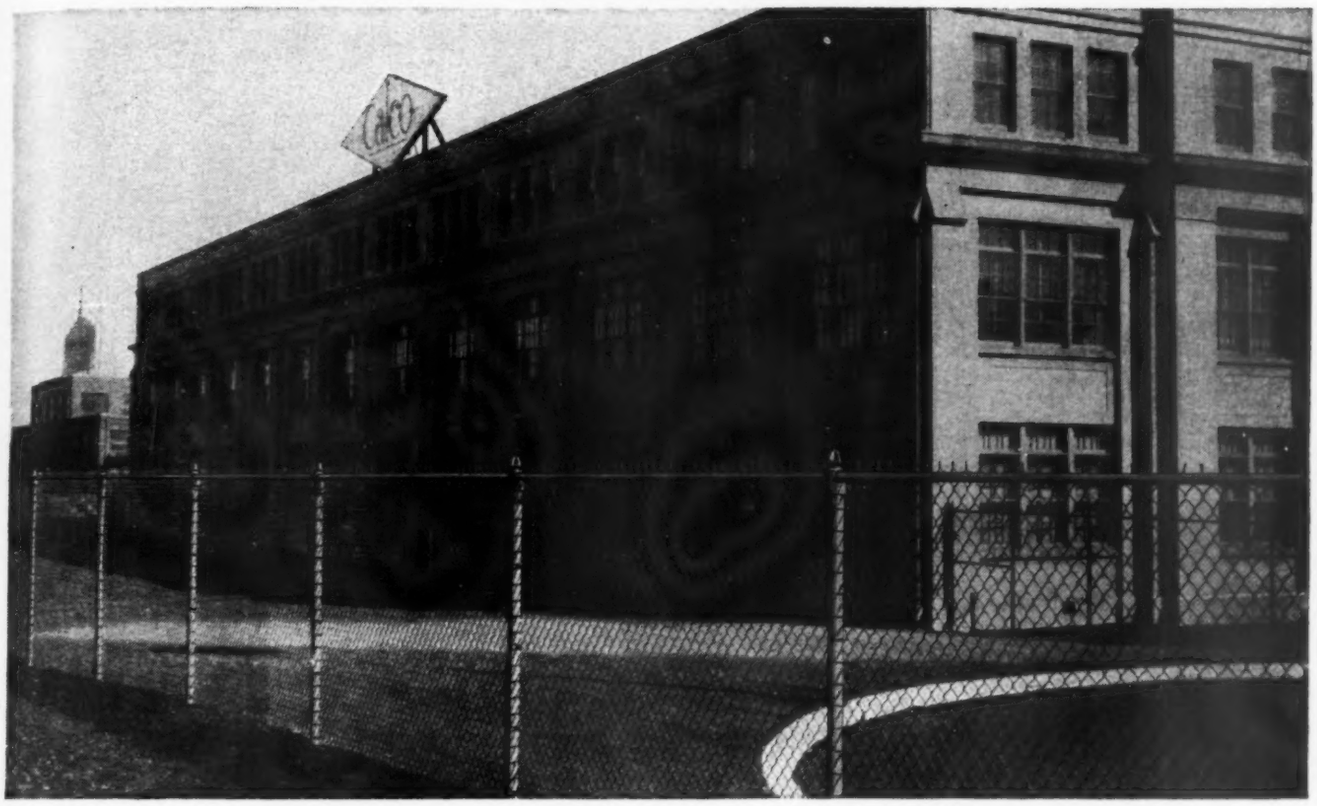
JOB EVALUATION and time study interpreted to employees in pamphlet, "Your Pay Envelope—And How It Gets That Way." Address inquiries to The National Blank Book Co., Holyoke, Mass.

SMOKE ABATEMENT discussed in pamphlet, "Have You Considered Overfire Jets For Smoke Abatement?" Address inquiries to Bituminous Coal Research, Inc., 912 Oliver Bldg., Pittsburgh 22.

INSECT CONTROL made safe and effective with screened device that holds DDT-impregnated flocking over light globe. DDT Lite, Inc., 3757 Wilshire Blvd., Los Angeles.

ELECTRONIC GAGING instrument per-

ANCHOR FENCE HAS PROTECTED CALCO CHEMICAL FOR 30 YEARS!



Write today for your free copy of the Anchor Industrial Fence Catalog showing diagrams and photographs of industrial installations. Anchor Fence Div., Anchor Post Products, Inc., 6620 Eastern Ave., Baltimore 24, Md.

SEND FOR THIS BOOK!

Relocation of Fence to Meet Plant Growth Simplified by Exclusive Anchor Method

Since 1914 . . . through two wars . . . Anchor Chain Link Fence has helped guard the Bound Brook, N. J., plant of Calco Chemical Division, American Cyanamid Company. From time to time, as Calco's facilities grew in size, the original fence was removed, repaired, reset, added to. Yet today, the Anchor installation still maintains its excellent alignment . . . still protects against trespassers, snoopers and trouble-makers.

FOUR exclusive Anchor features have built this record at Calco . . . and they'll give the same protection to your plant. 1. *Deep-Driven Anchors*, which hold the fence permanently erect and in line, in any soil, in any weather . . . yet permit easy relocation when necessary. 2. *Square Frame Gates*, amazingly free from sagging and warping. 3. *U-Bar Line Posts* of carbon steel, rigid and rust-free because their open construction is self-draining. 4. *Square Terminal Posts*, which increase strength, add durability and improve appearance.

For additional information on Anchor Fence . . . diagrams, fencing ideas, photographs of well-known plant installations . . . send for our factual Industrial Fence Catalog. Or ask for one of our experienced engineers to call and give you the benefit of his knowledge in solving your plant protection problems. Anchor Fence Div., Anchor Post Products, Inc., 6620 Eastern Ave., Baltimore 24, Maryland.

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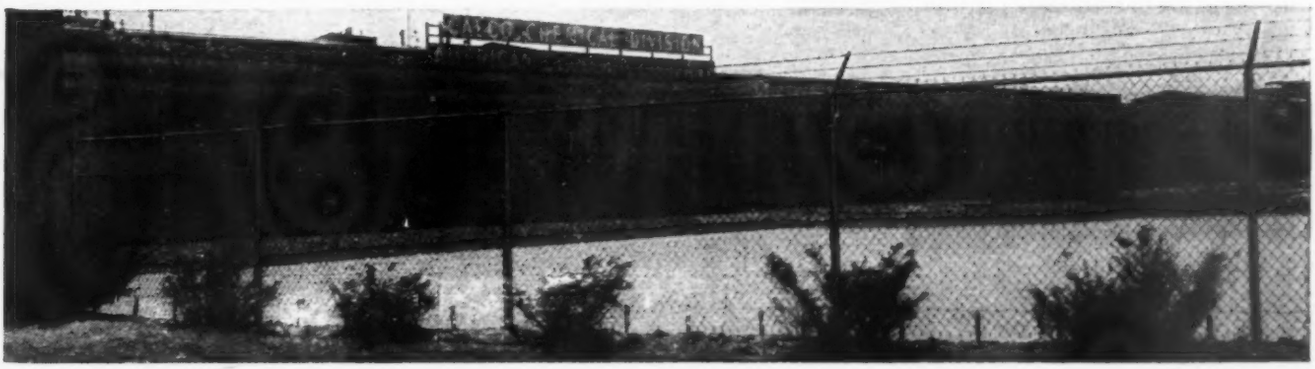
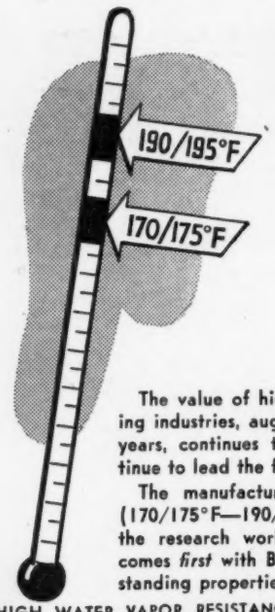
Nation-wide Sales and Erecting Service





Concerning...

HIGH MELTING POINT WAXES

The value of high melting point waxes to the packaging and processing industries, augmented by the demands made of them during the war years, continues to increase—and Bareco Microcrystalline Waxes continue to lead the field.

The manufacture of these fine quality high melting point waxes (170/175°F—190/195°F) is the main objective of the operations and the research work at our modern Barnsdall refinery—for wax-making comes *first* with Bareco. You owe it to yourself to investigate these outstanding properties of Bareco Waxes. . . .

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● PIERCE Fuses with their Balanced Lag place more of the lag within the low overload working range where it belongs. Thus, unnecessary blows and shutdowns are avoided. BUT, they *do blow* when shorts or grounds cause current surges at the higher ranges, and when failure to blow is dangerous to equipment.

Pierce Superiorities Mean More Protection

Among them: *Screen Ventilation* avoids storing of heat, permits instant escape of gases, and prevents after-blow; tubular *Arch-Bridge* construction for *long life* and *easier replacement* of the scientifically designed Pierce *Balanced-Lag-Link.*

FREE

SAMPLE LINK

Sent for your inspection, together with complete data on renewable fuses. Just mail the coupon.

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BUFFALO 7, N. Y.

PIERCE RENEWABLE FUSES, INC., DEPT. L-8
211 HERTEL AVENUE, BUFFALO 7, N. Y.

Please send me complete data on renewable fuses, and FREE Sample of PIERCE Balanced Lag Link as checked at right.

YOUR NAME _____
POSITION _____
COMPANY _____
ADDRESS _____
P. O. _____ STATE _____

[ ] 30 Amps.
[ ] 60 Amps.
[ ] 100 Amps.
[ ] 200 Amps.
[ ] Voltage

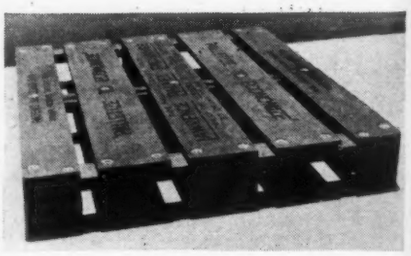
forms non-contact checking, continuous or spot, of thickness for all types of moving materials. The Sheffield Corp., Dayton 1, Ohio.

GOOD MANAGEMENT practices listed in the pamphlet, "Outline for a Management Audit." Policyholders Service Bureau, Metropolitan Life Insurance Co., New York.

"ELECTRONICS DIGEST," pamphlet, records various developments of electronics for commercial use. Westinghouse Electric Corp., Pittsburgh.

WATERPROOF ADHESIVE is resistant to oxidation and is recommended for bonding synthetic rubbers, vinyl films, sheet stocks, to rigid surfaces. Du Pont Fabrics Division, Fairfield, Conn.

SAFE HANDLING and first aid procedures discussed in the folder, "How To Use Carbon Tetrachloride Safely: Tips To The Foreman." Safety Research Institute, Inc., 420 Lexington Ave., New York 17.



STANDARD PALLETS and an exchange service that will circulate pallets now offered. Lawrence Pallet Exchange, 37 Drumm St., San Francisco 11.

HIGH SPEED STEEL with increased carbon content has high hardness from heat treatment and is said to have greatly increased performance capacity. Vanadium-Alloys Steel Co., Latrobe, Pa.

NICKEL-BASE ALLOYS, two specialized types, resist corrosion from hot acids; have mechanical properties for a wide range of usefulness, such as in pumps, valves. The Duriron Co., Inc., Dayton 1.

MARKING MACHINE uses grit blast against stencil mask to mark delicate parts having ground or mirror surface. Jas. H. Matthews & Co., N. Y. C.

FILMS: Screw machine movie, 16 mm, sound, shows construction and operating features of Greenlee 6-spindle machine. Greenlee Bros. & Co., Rockford, Ill.

"Magnesium, The Miracle Metal," 16 mm, shows refining and processing, production of castings, machining and finishing operations. Hills McCanna Co., 3025 N. Western Ave., Chicago 18.

"Design For Arc Welded Structures," 16 mm, sound, color, shows fundamentals of welded design and deals with new developments. The Lincoln Electric Co., 12818 Coit Road, Cleveland 1.

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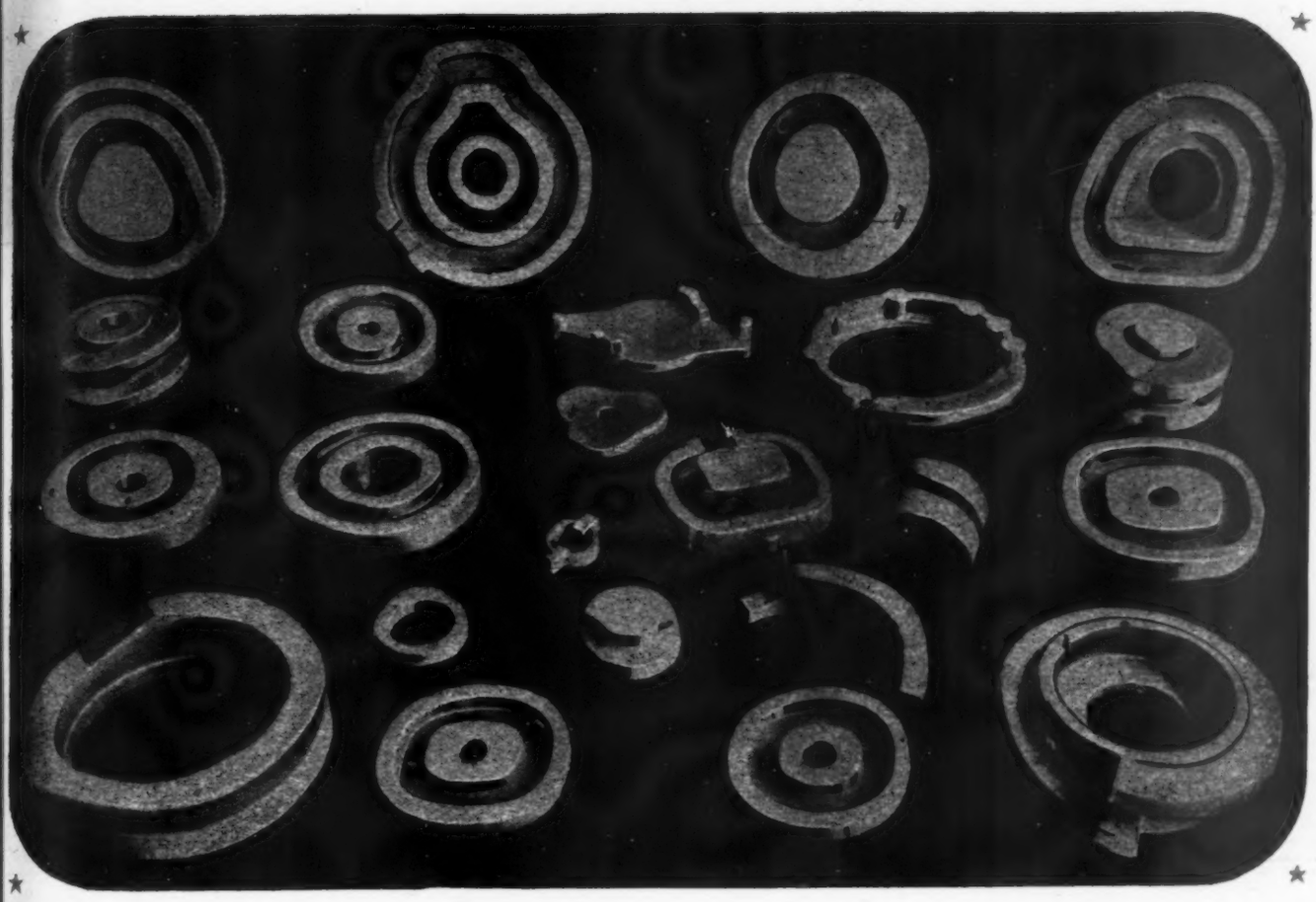

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IT WILL pay you to look into this method if you build or operate machines that use cams. Cast to shape from FCC Air Hardening Steel, your cams reach you with only an eighth-inch to be machined off, even from very intricate shapes. Of course this means big savings of time and material.

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A filter used in Morton Salt Company brine evaporating process. Nickel Alloy drums use Monel Metal bolts and rivets.

OF the destructively corrosive effect of salt and salt brine upon common steel probably no one knows more than the Morton Salt Company . . . "when it rains it pours."

To reduce maintenance costs in their salt mining and evaporating processes the Morton Company relies upon Monel Metal in contacts with salt and salt brine, using Harper fastenings of the same non-corrosive, non-rusting alloy.

If you have chemical corrosion problems in your industry it will pay you to use Everlasting, non-ferrous fastenings. Consult Harper Engineers or order any of Harper's more than 4850 different types from stock.

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though continued payment of any such rates will not be illegal.

***APPROVAL NOT NECESSARY**

WSB approval is not necessary to reduce an employee's compensation comprised of a base salary or commission if the reduction does not bring the salary below $5000 a year. Thus, the Board informed one company that it need not pay the proportionate amount of a customary bonus due a key production employee before his demotion to a non-bonus job. The Board's general counsel pointed out that there is nothing in the Act to prevent the reduction of salaries in excess of $5000 a year. Moreover, the Act defines "salary" to include "additional compensation, on an annual or other basis." (La Crosse Trailer & Equipment Company, WSB.)

***REDUCTION IN VACATION BENEFITS DENIED**

The National Wage Stabilization Board refused to approve an employer's proposed reduction in vacation benefits on the ground that such reduction was not necessary to correct gross inequities or to aid in the effective transition to a peacetime economy. The employer had instituted a vacation plan during the war whereby 2½ days vacation were given after 2 months service. In addition to this 2½-day provision, the company increased the vacation after 5 months service to 1 week, and 2 weeks vacation after 5 years. Contending that the liberalized vacation plan had been instituted in order to attract labor during the manpower shortage, the employer sought to eliminate the 2½-day provision. The Board denied the employer's request on the ground that it was not allowed under current stabilization regulations. (Raymond Manufacturing Company, WSB.)

NATIONAL LABOR RELATIONS BOARD

***ABILITY TO PAY**

The fact-finding board, established to make suggestions for the solution of the Western Union Telegraph Company dispute, recently issued a statement concerning ability to pay as a factor in wage adjustments.

The board pointed out that while ability to pay is not the sole factor in determining the wage increase to pay, it should influence the weight of other factors. To consider it solely would be to favor inefficient producers in terms of a lower wage scale.

Second, it was pointed out that this factor is important as a limit in cases where the wage increase involved will raise rates above the currently prevailing levels for like or related employments. It is also of importance where the increase involved will narrow a long-standing differential between like or related employments.

Finally, the board pointed out that ability to pay is of weight where there

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MERCURY "JEEP":
Powerful—yet the most compact fork truck made. Ideal for smooth operation in confined areas. 2000 lb. cap.

Rugged, easily maneuvered and round-the-clock dependability—a cost reduction combination engineered into every Mercury fork truck!

By handling more tonnage with greater ease, spotting loads quickly and accurately, tiering to ceiling height—Mercury fork trucks conserve manpower, economize on storage space and speed the flow of materials.

Consult Mercury—learn how these handling economies can serve you. Write for Bulletin 201-6, containing complete description of the full Mercury line, or ask a Mercury Sales Engineer to call.

These Features, Pioneered and Perfected by Mercury, are Standard on all Mercury Fork Trucks—

HYDRAULIC HOIST:
Less than 50% of the usual moving parts.

ALL-WELDED FRAME:
No rivets to weaken sections.

SNAP-ACTION CAM OPERATED CONTROLLER:
Eliminates injurious arcing.

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Motor and drive are one unit.

MERCURY "YAK":
Next in tonnage capacity is the "Yak." Ruggedly designed for continuous heavy duty. Handles loads up to 4000 lbs. with ease.

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Most powerful fork truck in the Mercury line. Built for severe service and unusually heavy loads. 6000 lb. cap.

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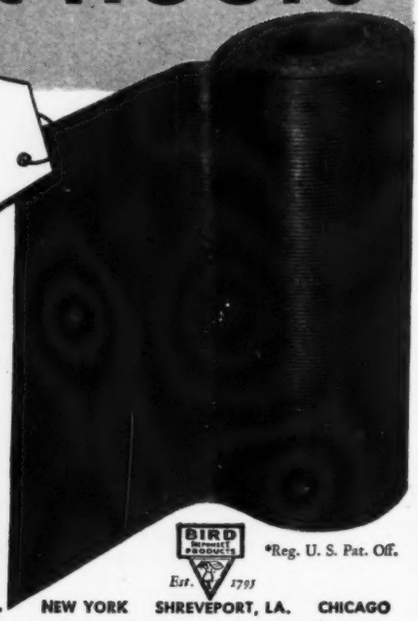
BIRD *Rubberlike* RUNNER

Long-Lasting Protection for

HEAVY TRAFFIC floors

FOR LESS THAN 6¢ per Sq. Ft.



Rubberlike, the modern composition floor runner, provides positive protection for heavy traffic areas at less than 6c per square foot—a fraction of what most mattings cost. Its sturdy corrugations cushion and quiet footsteps. Skidproof even when wet, Rubberlike makes slippery floors safe to walk on. Hugs any surface without cementing—won't curl at edges. Cuts cleaning costs . . . lasts and lasts under tough treatment on floors in factories, offices, schools, hotels, institutions. In rolls 27 in. by 100 ft. or 36 in. by 75 ft. Order from supply house or write for free sample to Bird & Son, inc., Dept. 611, East Walpole, Mass.

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Every detail of EWC Trailer construction is given scientific, expert attention—to assure dependable, durable performance all the way down the line! More than a half century of experience in building Materials Handling Equipment, plus engineering help to meet specific peculiar problems, assure you of the ideal equipment for your needs. Write today for Bulletins giving full details.

EWC TRAILERS

Electric Wheel Co., Dept. FA, Quincy, Ill.

is absence of profits because of managerial inefficiency, and where price increases may be obtained on the basis of wage increases instituted in keeping with stabilization rules.

In the case involved, the board recommended wage increases to restore the differential which had existed between the rates paid in the telegraph industry and those in the telephone industry. The increases were recommended despite the company's plea of inability to pay. But in so recommending, the board pointed out several factors that promise to alleviate the company's financial position, such as cost-saving technological improvements, internal economies, good business outlook, possible price increase, future revenue increase.

*MERIT INCREASE HELD SUBJECT OF COLLECTIVE BARGAINING

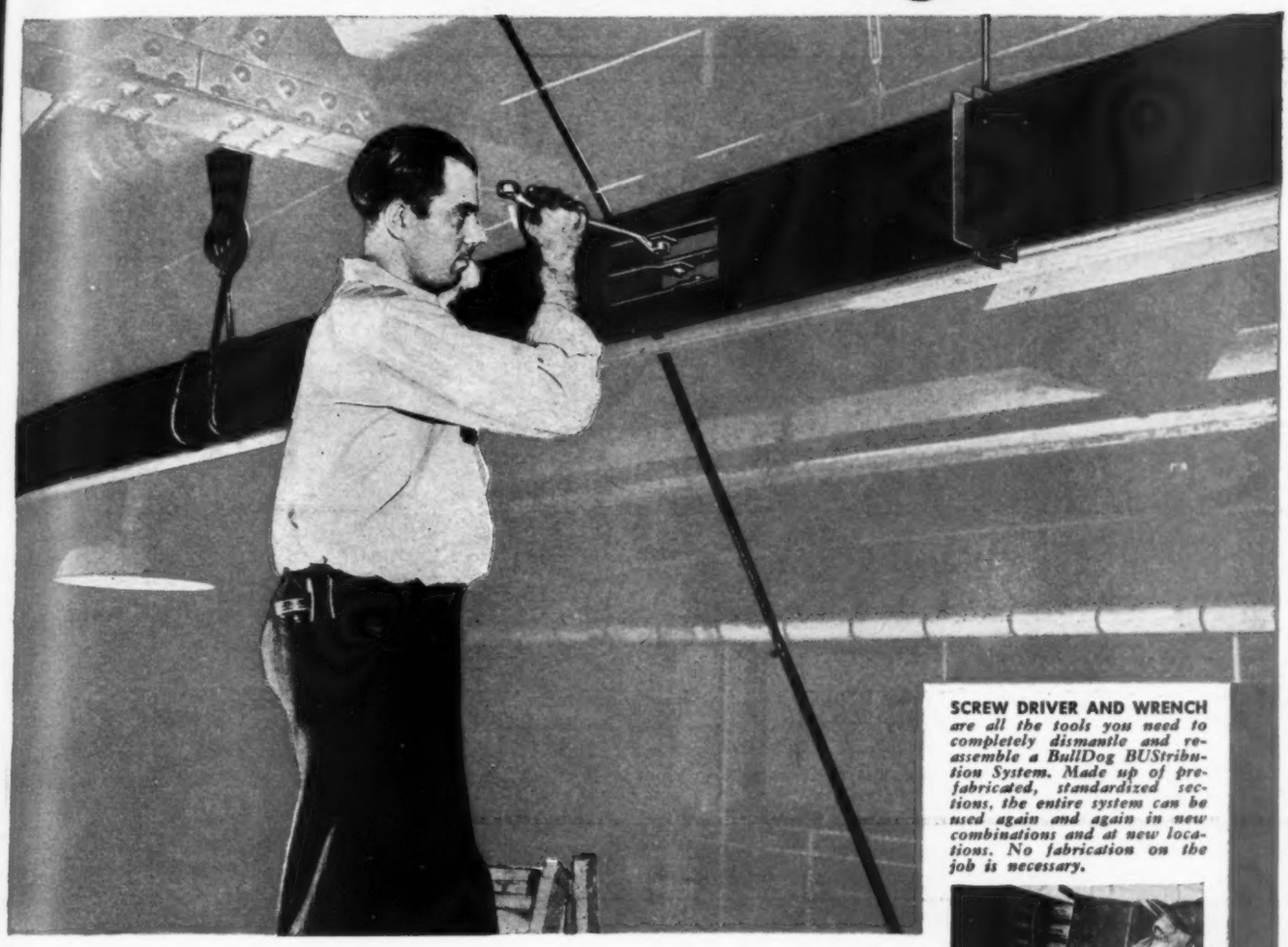
The latest word from the NLRB makes merit increases the proper subject of collective bargaining if the union wishes to include them in negotiations. This ruling was handed down in a case in which the employer was found guilty of an unlawful refusal to bargain because he refused to negotiate on merit increases, and refused to comply with the union's request for a list of employees who had received such increases and the amount of each. The refusal of the latter was made on the ground that merit increases are not the proper subject of collective bargaining, but rather an exclusively managerial function, and that the union could obtain such information from its members. The Board concluded that the company had not fulfilled its obligation to bargain collectively with the union. It, moreover, declared that merit increases are an integral part of the wage structure, and as such, a proper subject of collective bargaining. (J. H. Allison & Company, NLRB)

*DUTY TO SUPPLY WAGE DATA

The NLRB has, in two recent cases, defined management's liability in supplying unions with data on earnings, production or wage rates. On previous occasions, the Board has held that failure to supply a union with wage data to facilitate collective bargaining constituted an unfair labor practice on the part of the employer. However, the Board found in a recent case that an employer's failure to comply with a union's request for data on job studies, conducted by the employer, and on which his incentive plan was based, was not an unlawful refusal to bargain. The Board concluded that the employer's refusal was not made in bad faith in view of his invitation to the union to conduct its own engineering studies at the plant and his substantial counterproposals on many other issues. (Crompton-Highlands Mills, Inc., NLRB.)

In the second case, the Board found that the employer's refusal to furnish the union with detailed data concerning earnings and production records was not in violation of the Wagner Act, since the

Power line relocated . . . all material salvaged



You Can Do It With BullDog BUStribution DUCT

Manufacturers with an eye on tomorrow look to BullDog BUStribution DUCT for plug-in power supply, because this flexible bus duct system is *engineered for the future.*

"Moving day" in your plant can mean the time when your electrical system must be relocated, a new machine installed, or an old one shifted. In any case, BUStribution DUCT is ready for the change.

Built in standardized, prefabricated sections, it can be dismantled, moved and reassembled without scrapping a single nut or bolt. And when you shift a machine, the circuit protective plug moves right with it for easy mounting at the nearest plug-in opening. No cutting power . . . no tapping in "hot"—no lost production time.

Write for detailed descriptive folders. Or, better still, consult a BullDog field engineer who can show you a BullDog installation near your own plant.

SCREW DRIVER AND WRENCH *are all the tools you need to completely dismantle and reassemble a BullDog BUStribution System. Made up of prefabricated, standardized sections, the entire system can be used again and again in new combinations and at new locations. No fabrication on the job is necessary.*

NO WAITING FOR POWER *with a BUStribution System—simply raise the plug to the nearest plug-in opening, snap its contact fingers over the busbar conductors and bolt the plug to the duct casing. The plug itself is a current protective device for the machine it serves.*

NO SCRAP WITH ANY MOVE! *There is no waste when you move a BullDog BUStribution System from one location to another. The component materials—steel duct, copper bus bars and vitreous porcelain—do not readily deteriorate and can be used indefinitely.*

Capacities: Feeder type—600 amps. to 4,000 amps.; Plug-in type—225 amps. to 1,350 amps.

BullDog Also Manufactures Vacu-Break Safety Switches—SafToFuse Panelboards—Switchboards—Circuit Master Breakers—Industrial Trol-E-DUCT for Portable Tools, Cranes and Hoists—Universal Trol-E-DUCT for completely flexible lighting.

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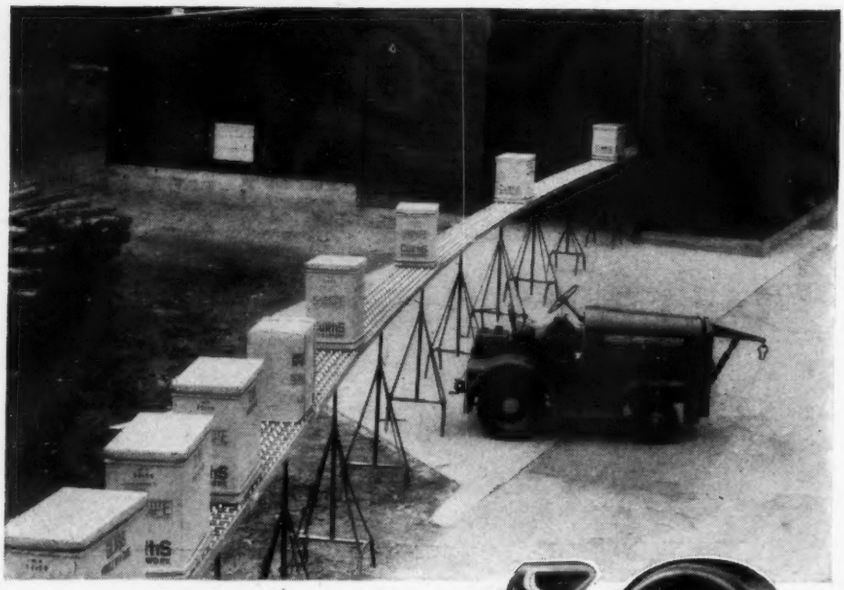

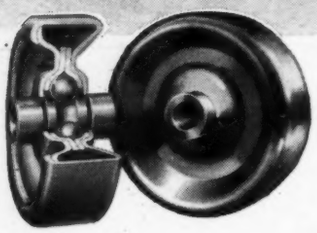

WHEELS DESIGNED FOR SUPERIOR PERFORMANCE

Exclusive wheel design, specially engineered for Rapid-Wheel gravity conveyors, guarantees longer operating life . . . offers a superior performance under many severe conditions.

Tests prove that the Rapids-Standard No. 11 recessed-hub conveyor wheels that are grease-packed on assembly are less vulnerable to corrosion, are longer-lived . . . give more efficient service. These tests compared the special Rapids-Standard grease-packed wheels with ordinary wheels that had no lubrication.

Both wheels were placed in a testing machine and were run intermittently for sixty-one hours; sixteen hours in operation, idle for eight hours. The wheels were sprayed with salt solution before and after each operation. After the test both wheels were cut open and examined. The ordinary greaseless wheels were seriously corroded while the special, lubricated wheels functioned normally . . . both the interior and exterior were in excellent condition.

Further life-tests with over-load on the wheels show the grease-packed wheel has 2½ times longer operating life.

All Rapid-Wheel portable, gravity conveyors are equipped with these special wheels. This, plus their many other features, give you efficient, economical service . . . helps you cut costly man-handling operations . . . increases production.

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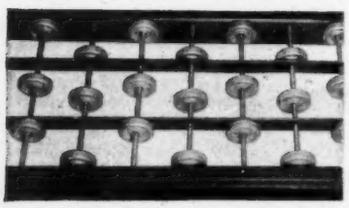

RAPID-WHEEL CONVEYOR SPECIFICATIONS

Model No.	Width	Wheels per foot	Rated Capacity (Lbs. per 10 foot section)	Weight per foot
12-RS-12	12"	12	600	7.8
12-RS-10	12"	10	550	7.5
12-RS-8	12"	8	500	7.1
12-RS-6	12"	6	450	6.7
18-RS-18	18"	18	750	9.8
18-RS-16	18"	16	700	9.4
18-RS-14	18"	14	650	9.0
18-RS-12	18"	12	600	8.6

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Manufacturers of

STEEL FORGED CASTERS · TRUCKS · CONVEYORS · POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division—370 Peoples National Bank Bldg., Grand Rapids 2, Michigan

union did not show that its negotiations were impeded by the lack of such data. (Pool Manufacturing Company, NLRB)

***DUTY TO INQUIRE INTO UNION'S REQUEST FOR DISCHARGE**

A recent NLRB decision has indicated the responsibility management bears in inquiring into the reasons behind a union's request that an employee be discharged under its closed-shop contract. The employer involved in the particular case was found guilty of discrimination for effecting such discharges.

In this case the union expelled a group of employees because of activity they engaged in for a rival union just prior to an election. The employer, presented with the contracting union's request for discharge, removed the employees from the company's payroll without investigating the union's reason for expulsion. Brought up before the Board, the company contended that "it is for Congress and not the Board to prevent employees from performing closed-shop contracts made pursuant to the express language of the proviso to Section 8 (3) of the Act, if it appears desirable to prevent abuse of such contracts; and that in any event, it would be unjust to require the company to determine whether the union's asserted motivation was 'merely ostensible and not real' on the ground that the company could not 'necessarily have deduced' the union's true motive."

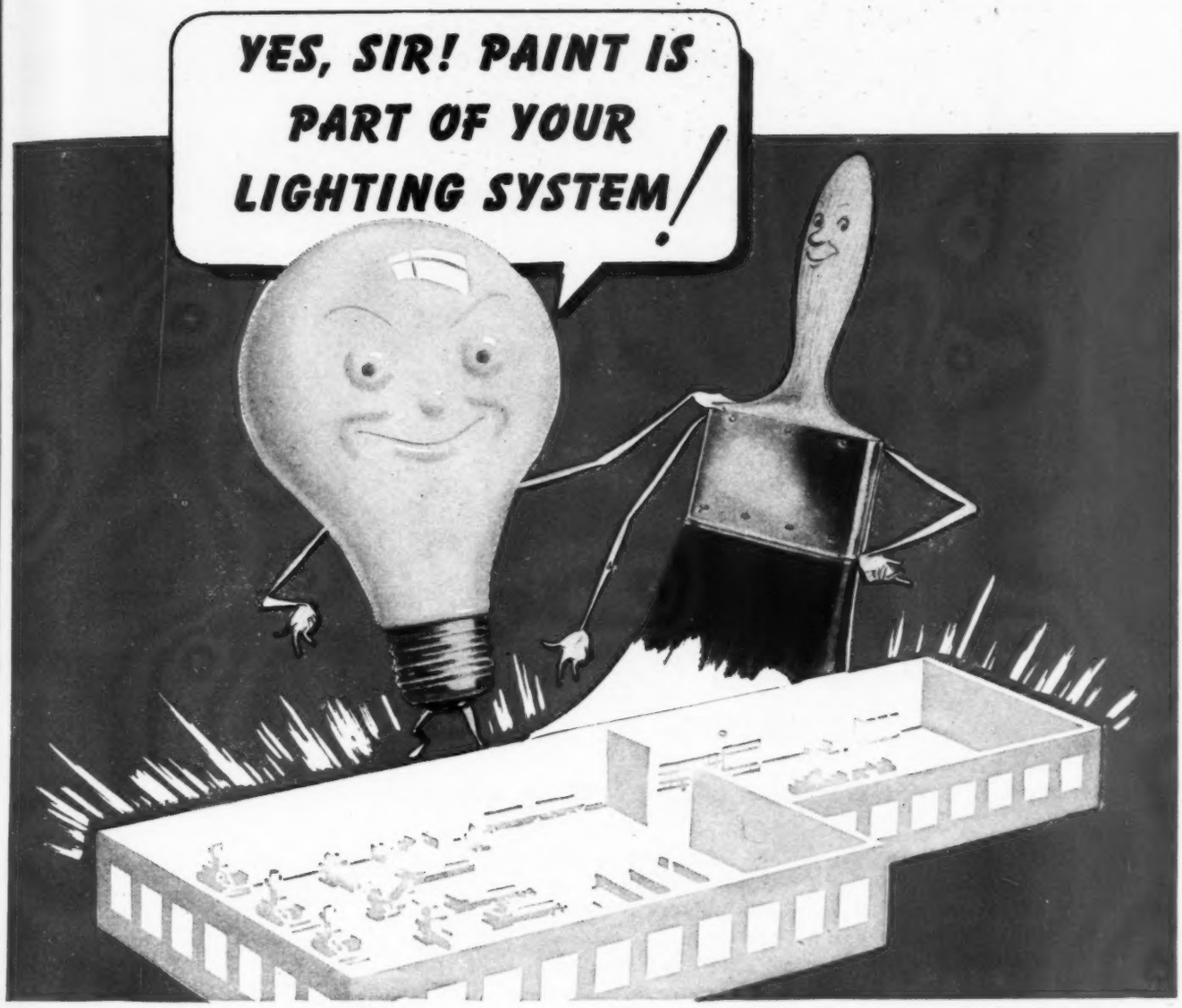
Rejecting this latter argument, the Board concluded that the employer had effected discriminatory discharges, and that in view of the union's widespread campaign among the employees during the pre-election period and the company's knowledge of it, the company made no *bona fide* effort to evaluate all the evidence when it allegedly decided, despite the union's failure to deny the obvious facts, to believe that the union was not acting in reprisal against the employees because of their activities for the rival union. (Colgate-Palmolive-Peet Company, NLRB)

***HOLIDAY PAY ORDERED**

An employer was held liable for holiday pay provided for in the contract when the holiday fell on a normal working day despite his contention that the holiday in question did not fall on a normal work day since it fell within a three-day shutdown. The arbitrator declared that such a shutdown did not constitute a change in schedule, thus relieving the employer of his contractual obligation to make holiday payment to those employees who had worked during the week of the holiday. (In re arbitration between Vulcan Detinning Company and International Union of Mine, Mill & Smelter Workers)

COMPANY BOUND BY ARBITRATION PROCEDURE

An employer was held to be bound by arbitration provisions written into the contract at the WLB's direction and



THE TREND toward higher industrial lighting levels is a healthy and hopeful sign. Surveys show but one plant in 100 has enough light for the quick, easy, accurate seeing so necessary to fast, efficient production.

But in planning lighting installations, don't forget to include **PAINT** in your calculations. For paint, too, is part of your lighting system!

WHITE has far greater diffuse reflectivity than any other color. White-painted ceilings and walls, therefore, assure maximum efficiency from lighting fixtures. And, equally important, they help to distribute the light evenly throughout the working area and thereby banish those three arch-enemies of good seeing; glare, harsh shadows, and extreme brightness-contrasts.

For down-to-earth data on the relationship between Light, Paint and Seeing, let us send you a copy of "Light and Color in the Work-World." To get your copy, just fill out and mail us this coupon TODAY.

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here's why "KEX" WIPING TOWELS have hundreds of more wipes

One look at a KEX Industrial Wiping Towel tells you you're going to get greater performance. Just compare! Every square inch of a KEX Wiping Towel is usable wiping surface—no buttons, hooks, hard seams as with ordinary rags, no loose threads to catch in machinery. KEX Wiping Towels are soft and safe for delicate surfaces—yet tough enough for any job in the shop.

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Why put up with the inefficiencies of sub-standard wiping materials another day? Install the KEX Wiping Towel system today, improve performance and *save* on wiping costs. There's nothing to buy, no expensive inventory—just a low monthly rental. For complete information, phone your local KEX representative, now—or write KEX National Service, 295 Fifth Avenue, New York 16, N. Y.

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LABOR DEVELOPMENTS *(continued)*

could not seek relief from the arbitration clause of the contract on the ground that the contract was signed under the threat of seizure of its plant by the government. Such circumstances do not constitute duress, the court stated. The employer had ratified the contract, affirmed its validity, and lost his right to void it by operating under it for 15 months. (Geanata v. Bushey & Sons, N. Y. Sup. Ct.)

***THREATENED BOYCOTT NO DEFENSE**

The fact that the employer will be faced with a boycott should his employees select a particular union does not justify his conduct in making coercive speeches and reorganizing his business so as to avoid dealing with the union. The employer assembled his employees during working hours and threatened their economic security if the union involved were to win the election. After the election had established the union as bargaining representative for the employees, the employer reorganized his business to avoid dealing with it. The NLRB, finding the employer guilty on both counts, ordered the reorganized business to recognize and bargain with the union. (Pioneer Electric Co., NLRB)

REFUSAL TO SET ASIDE AN ELECTION

The NLRB refused to set aside the results of an election on the union's charge that the company interfered with the employees' right to free choice in an election because an interoffice memorandum urged the employees to vote against all the unions listed on the ballot. Since the memorandum contained no threats or coercive statements, the Board held it to be privileged free speech on the employer's part. (Columbia Broadcasting System, Inc., NLRB)

***INJUNCTION GRANTED**

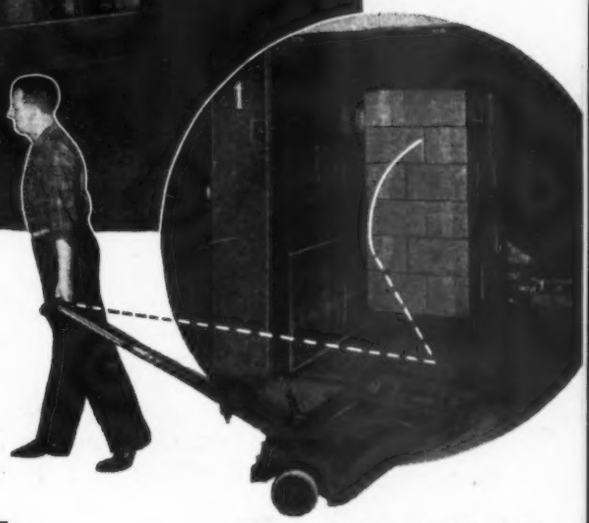
Reversing a lower court, a circuit court of appeals enjoined the union from interfering with the operations of a strike-bound railroad. The lower court had denied the company injunctive relief on the ground that its previous labor policy was the cause for the abandonment of the railroad. The higher court finding that the company had tried to arbitrate but had been rebuffed by the union, issued the injuction on the ground that the company had fulfilled all statutory requirements necessary for injunctive relief. (Farmers Grain Co., v. Toledo, Peoria & Western R.R., CCA-7)

HELD DISCRIMINATORY DISCHARGE

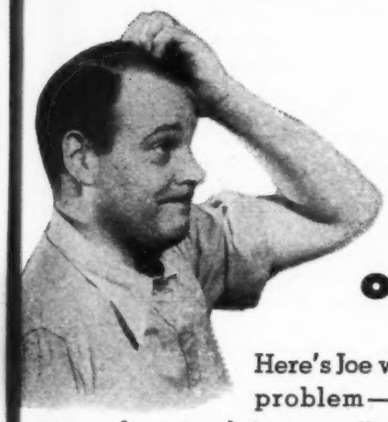
Having condoned the strikers' action by agreeing to rehire all strikers if the strike were ended, the employer could not single out a union leader and discharge him on the ground that he participated in a strike. Such a discharge becomes discriminatory when the employer offers employment to all the strikers, which nullifies his right to refuse employment to employees engaging in illegal strikes. (Carey Salt Co., NLRB)

This truck is all tied up!

...a platform truck, gone to the second floor for loading. And here, by means of a light bulb attached to the worker's wrist, the camera shows what that unloading involves... all the waste moves that must be made before the truck is free!



New Light on an Old Problem!



Here's Joe with an old problem—a load to move and no truck to move it. The truck he wants is upstairs—*loaded*. And here, in this authentic camera study, you see what must be done before he gets it back ... all the waste time and effort of unloading piece by piece, only to *re*load the same materials next time they're needed!

You can eliminate all this piling and unpiling—and keep your trucks always ready for action! For with Barrett Lift-trucks and Skids, the Skid stays with the load, keeps it as a unit, while one simple move sets the Lift-truck free!

In moving materials from room to room, floor to floor, or in and out of trucks, the Barrett System enables *one man* to do more than *3 or 4*. Your Barrett engineer will gladly show you how—no cost or obligation.

This truck is ready for action!

It's a Barrett Lift-truck, leaving the elevator after depositing a loaded Skid. With one simple move, the Lift-truck rolls out for more action . . . while a second Lift-truck meets the up-going load!

Send for your free copy of the Barrett Junior Catalog ... 147 pages, with a cost-saving tip on every page!

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TRIFLES
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TUFFALT Iron Asphalt
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is monolithic, and vermin proof . . . providing no place to allow the breeding or habitation of insect life . . . the tiny trifles that can cost millions in materials destroyed and employee health impaired. What is your particular floor problem? TUFFALT Research Engineers are at your disposal to solve your problem.

Installation of Tuffalt does not interrupt your production.

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Waterproofing Materials Concrete Floor Hardeners Mildew and Rot Proofing
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"A Patch or an Acre"

they say and do

THE GOAL OF STEADY EMPLOYMENT

HENRY FORD II, President of the Ford Motor Company, addressing the Economic Club of Detroit

National surveys show that well up at the top of the list of what the American wage earner wants—perhaps at the very top of his list—is *security*. By "security" he means, more than anything else, steady employment—the chance to work continuously at good wages.

Of course, the American wage earner wants to own his own home. He wants life insurance and savings accounts. He wants his children to have a chance to educate themselves for better opportunities. But steady employment is a prime consideration to ten times as many workers as "high pay," and steady employment is a prime consideration to twenty-five times as many workers as "short hours."

The security which the American wage earner wants is not tied to any official scheme of government, the unions, management, or anyone else. It is a broad and comprehensive desire. As a matter of fact, the surveys show that the average American worker would prefer to work out his own problem of security in his own way without help from employer, the state, or his union—provided only that he has steady work at good wages.

The idea of steady employment is sometimes discussed these days under the title "The Guaranteed Annual Wage." In a great many ways this seems to me a poor choice of words. It is misleading. It comes a little too close to being a political phony. It suggests that someone is in a position to guarantee an annual wage and is merely refusing to do so. I doubt very much whether the American wage earner really believes that anybody can guarantee security in this world. What he really wants is steady employment at a fair rate of pay.

This normal human desire on the part of our employees for greater stability in their jobs is a challenge to mass production management. The production record during the first year of peace has turned the spotlight on some of the great difficulties to be overcome. We at Ford Motor Company are certainly not today in any position to "guarantee an annual wage." But progress toward more stable employment is greatly to be desired, and I should like to discuss briefly some of the considerations we face when we start thinking about what can be done toward a more stabilized employment in the automobile industry. . . .

First, any sound plan to provide more stable employment must increase production and reduce the cost of cars to the American people.

I consider this to be of the greatest importance.

If what we do is to be in the public interest, it must mean lower costs. For if it increases the cost of producing automobiles, it will lower the standard of living by reducing the number of people who can afford to buy motor cars. The market for our products will shrink—and employment will shrink.

The fault with most plans I have seen for a so-called "Guaranteed Annual Wage" in the automobile business is simply that they guarantee an increase in manufacturing costs. Unless such a plan would clearly insure a substantial increase in *productivity* or in economies to offset the increase in costs, it is obvious that the result would be simply to increase the cost of automobiles. To that extent, the standard of living of all Americans would be reduced—including those who would seem to benefit from such a plan.

Success in the field of mass production depends upon ever lower costs. Lower costs make possible greater quantity production, and greater quantity production makes possible lower prices. No manufacturer in a mass production factory is interested in any program involving higher prices for fewer products. Nothing gives the mass production manufacturer greater *dis*-satisfaction than rising costs and rising prices.

MORE GOODS, LOWER COSTS

The tragedy of the period of strikes through which we are still struggling is the very fact that spokesmen for labor, anxious to show their ability to force concessions, have succeeded. But, in the process, they have stifled production—and it is production, more than anything else, that has always lowered prices, always increased buying power, always defeated inflation. The competitive scramble to reduce the cost of things so that more and bigger markets can be won is the force which leads to an increase in the standard of living of the wage earner and all the rest of us. When a scramble to increase wages is accompanied by a cut in production, it leads to inflation, lower standards of living, and the kind of boom that busts.

We need constantly to be reminded how well off we are in this country as a result of our capacity to produce. One out of every five Americans owned an automobile prior to the war, whereas only one person out of twenty-two owned a car in France, and only one in twenty-three in England.

One in every five persons in this coun-

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INTRODUCED only a month ago, the new 32 ALUNDUM Grinding Wheels are already making truly sensational records. *And there are definite reasons.*

32 ALUNDUM Wheels are Sharper

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There's More Usable Abrasive in 32 ALUNDUM Wheels

32 ALUNDUM abrasive is over 99% pure fused alumina—no slag—no pores. You not only get *more* sharp cutting points in a 32 ALUNDUM wheel but points that don't dull easily because they're all *usable* abrasive.

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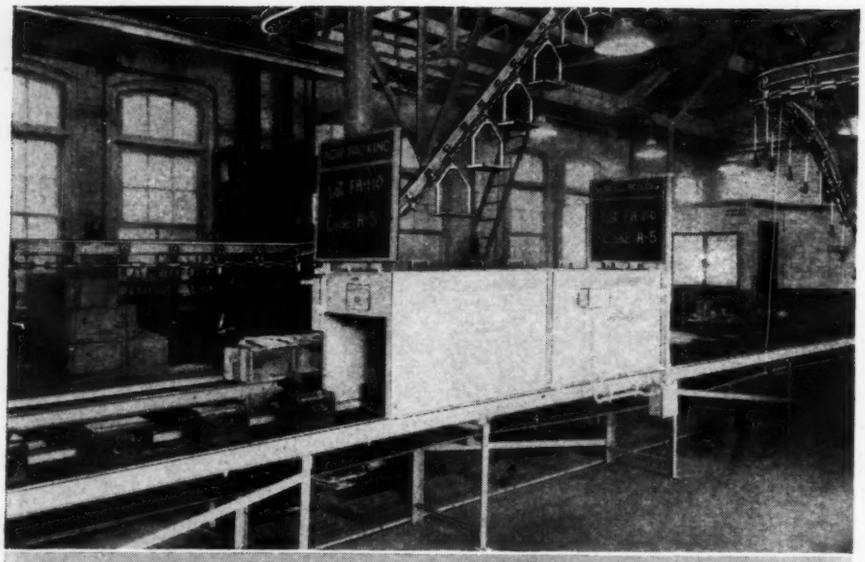

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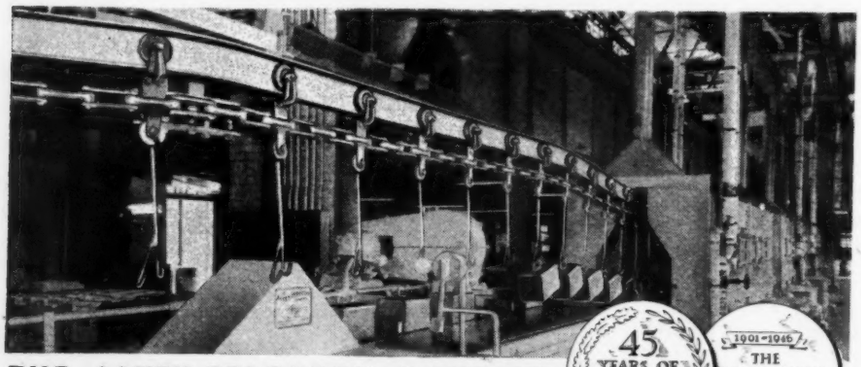
A-F Engineered and Manufactured

IN THE LARGE plant shown, the two illustrations picture an A-F Conveyorized infra-red stencil drying unit and an A-F Overhead Trolley Conveyor carrying filled, hermetically sealed containers through a cleaning and drying unit. In all, *thirteen different operations* are performed, including tests for leaks, two washes, two rinses, drying, surface treatments, paint dippings, stenciling and infra-red drying. From unloading platform to storage and shipping, the work flows quickly, efficiently, economically!

WITH TWO correlated departments for designing, engineering and manufacturing conveying equipment and metal products cleaning and finishing equipment, Alvey-Ferguson is unique in being able to offer you a completely co-ordinated and conveyorized cleaning and finishing system based on forty-five years of experience.

There is no substitute for this 45 years of experience. It can help you in many ways. Why not discuss *your* materials handling problems, products handling problems and metal products cleaning and finishing problems with A-F Engineers? Write today!



45 YEARS OF SERVICE TO INDUSTRY

1901-1946 THE ALVEY-FERGUSON COMPANY CINCINNATI, OHIO A-F

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try has a telephone. Prior to the war only one person in 18 had a phone in England, and there was only one telephone for every thirty people in France.

Turn the statistics over and look at them from the other side. Before the war, an Englishman had to work five times as long as an American to buy a radio. The Frenchman had to work four-and-a-half times as long.

The reason is that we are greater producers than either of those nations. We produce more of the world's goods. Therefore, we have more of the world's goods to divide.

Furthermore, this is not a completed process—even in America. In 1914 the average man in this country had to work 15 minutes to earn enough to buy a loaf of bread. By 1946 he needed to work less than 5 minutes.

In 1914 a man had to work an hour and 31 minutes to earn enough to buy a dozen eggs. By 1946 he had to work less than half an hour.

Real wages, in short, are directly proportionate to the wealth of the nation—to the total amount of things we have to divide.

NEW THINKING NEEDED

The second thing which it seems to me we must keep in mind is this:

Any sound plan to provide more stable employment will require fresh thinking on the part of all of us.

When a complex and difficult engineering problem seems to have no solution, the fault may lie in the fact that we keep starting from the same premises, and thus keep reaching the same conclusions.

Both management and labor will undoubtedly have to adopt new points of view if we are to approach, even in one industry, new horizons in level employment. . . .

Through new approaches to automotive engineering and design, and through invention and refinements in manufacturing techniques, we must somehow find the road to lower-cost motor cars.

Just how this will be done, I do not know. But we at the Ford Motor Company consider the problem so challenging that we plan, as you know, to invest millions of dollars in a new research and engineering center.

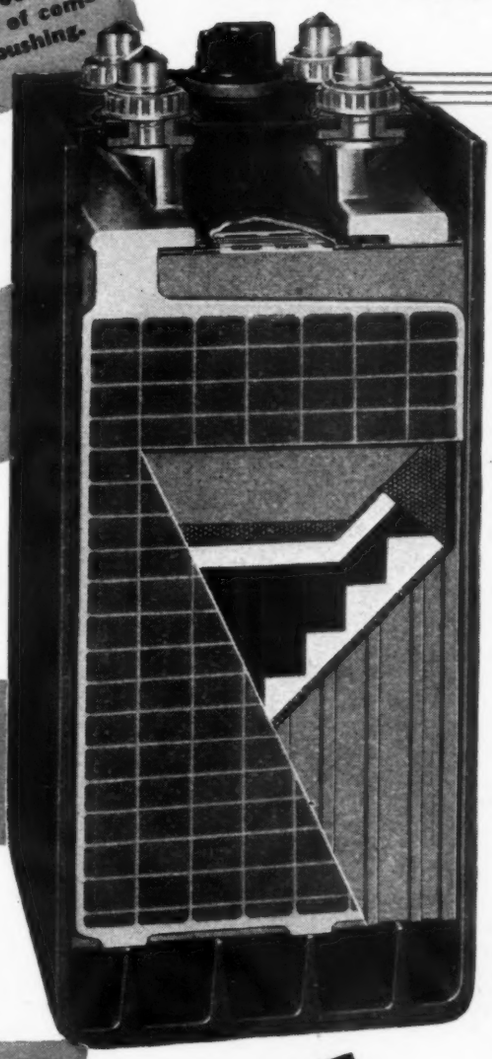
But improvement in the *machinery* of production will not be enough. We must solve the pressing problems of the *human* factor in production. And here, again, vigorous fresh thought on the subject is called for.

I expressed early this year the opinion that if we in this country would give to human relationships the same hard-headed, objective consideration that we have given to engineering problems, we might do as much to raise the standard of living in this country during the next 10 to 25 years as we were able to accomplish during the past 25 years through developments in the field of machine technology. . . .

It also seems to me that organized labor must apply fresh thought to its use

Setting New Records

Gould Kathanode Batteries have a service life 80% longer than flat plate batteries


Leak-proof seal instead of common bushing.
Duraplor rubber separators replace wood type.
Double-wedge grids replace box type.
Black Oxide, a new type of active material compounded by Gould.
Unit-Seal perforated rubber envelope for extra plate protection.
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Monobloc containers of high impact strength.
Special negative active material compounded by Gould.

Gould introduced the Kathanode battery in 1925. Then, for the first time, American industry had a battery that would deliver 100% or more of rated capacity throughout its entire service life.

Since 1925 every part of the Gould Kathanode has been the subject of constant research and field tests. Many of the improvements developed are listed at the left. Together they mean that the Kathanode of today not only has greater capacity but maintains that capacity 80% longer than ordinary batteries.

Longer service life means more work done per dollar invested. Get the facts. Write Dept. 111, Gould Storage Battery Corporation, Depew, N. Y., for the latest Kathanode catalog.

MEMO

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GENERAL MANAGER

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Blades made for the job COST LESS

Only from a complete line can you be sure of getting the blades that cut cleanest, fastest, longest on *your* work.

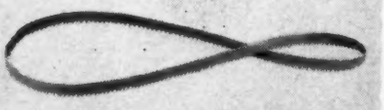
The Victor line is *complete*. And your Victor supplier can help plenty in advising "which blade for what use." See him. And for further money-saving help, ask him for Victor's booklet of hack saw hints. There's a copy waiting for you, free.

• HAND BLADES

• POWER BLADES

• FRAMES

• BAND SAWS
(including skip-tooth) (metal and wood-cutting)



VICTOR
Victor Saw Works, Inc.
Middletown, N. Y.
Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

of the strike. There is no longer any question of the *right* of organized workers to strike. But the right is being widely misused. It has become today a political weapon for the acquisition of power. It has become a method for establishing or entrenching labor monopolies. It has been and is being used by enemies of American freedom to cause domestic unrest and to cut our productivity. The indiscriminate use of the strike must certainly have the effect of reducing the standard of living of the wage earner by raising costs.

As we approach this problem there is a final over-riding consideration which I think is of the utmost importance:

Any sound plan for a highly desirable goal, like more stable employment, will be reached only through honest, straight-forward effort.

None of us—in management or labor or government—can afford to lose the democratic art of getting along with each other—of hopefully working toward common goals through compromise and agreement. We cannot afford to substitute for a frank, honest approach to our problems, the political habit of painting situations either entirely black or entirely white, depending on who is doing the painting. Points of view can be honest disagreements of good Americans without becoming ballyhooed emotional differences of partisans.

Such problems as the need for a more stable employment cannot, it seems to me, be solved in any atmosphere of hysteria and prejudice. They call, rather, for an honest and sincere determination to work out our difficulties together as free Americans.

Unless we are willing to give up a substantial part of our freedom, we cannot expect the "Government" or "The Public" or some fact-finding board to come up with a solution to our problems. As free Americans, we cannot shirk the responsibility, however burdensome and irritating it may sometimes appear, of working out our own answers. . . .

SECURITY—OR FREEDOM

Throughout history it has been necessary for people to make the choice between freedom and seductive promises of security. To give up freedom for these seductive promises has always been a bad bargain. When freedom goes, security goes with it. The offer of every tyrant and every tyranny is security in exchange for personal freedom. We would make a bad bargain indeed if we as a nation ever lost sight of the fact that it is freedom which has made us strong; that it is freedom which has given more real security to more millions of people than enjoy it in any other great country in the world.

Anyone who deals bluntly with the problem of steady employment will quickly face a sobering realization that the task is great and the difficulties many. I have expressed my feeling that three of the honest specifications for such a plan are that it must have the effect of increasing production, it must

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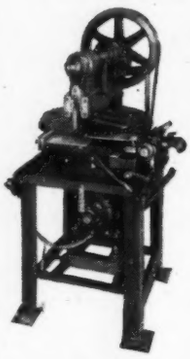

Above — Type of Power Press. This model provides combination of ¼ and ⅜" letters.

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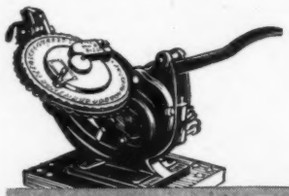

The Hand Label Embosser (above)

Hand-operated Model BB (left).

ROOVERS

COMPLETE *Finishing* SYSTEMS

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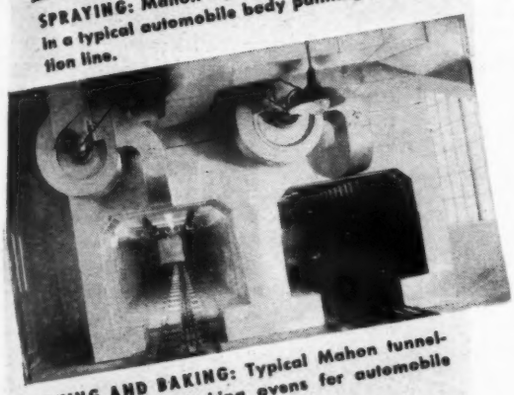
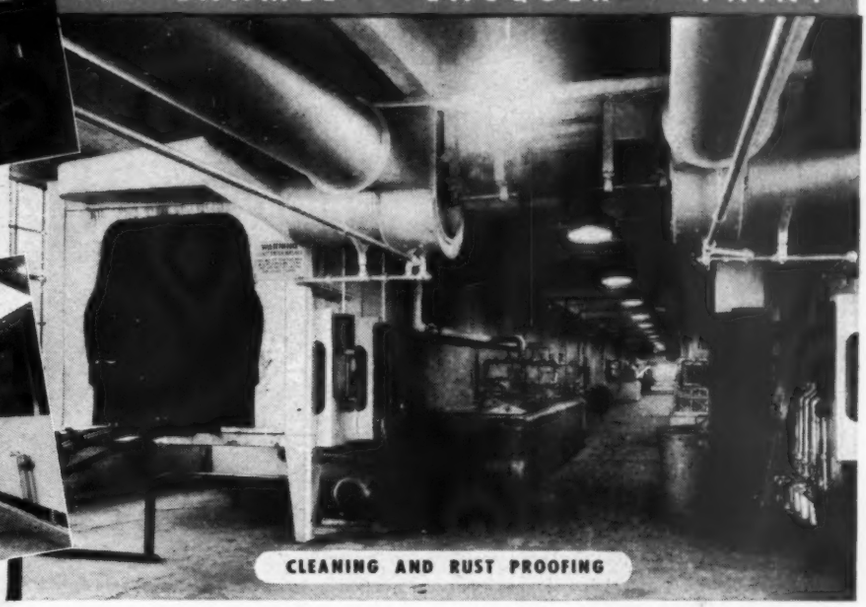
SPRAYING: Mahon Spray Booth Arrangement for painting underside of automobile bodies.

SPRAYING: Mahon Hydro-Filter Spray Booths in a typical automobile body painting production line.



DRYING AND BAKING: Typical Mahon tunnel-type drying and baking ovens for automobile bodies.

PAINT RECLAIMING: Typical Mahon overspray reclaiming system—part of a large automotive installation.



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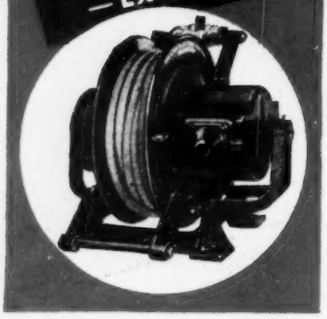
DUE TO CONDUCTOR CABLE FAILURE



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No costly time losses or cable repairs with Appleton Reelites because the cable is held gently taut—excess is reeled up out of the way—no chance for tangles, kinks, or breaks! Electrical current is kept constantly, smoothly supplied to moving machinery.

Over 23,000 of these automatic cable tenders are now working with maximum efficiency and economy on all types of electrical machinery from portable hand drills to electrical lifting magnets, hoists, chargers, motor generator sets and cranes. Their sturdy construction (cast of heavy, durable material) is giving a lifetime of trouble-free reeling and hard usage.

Appleton Reelites will serve you profitably, too. So start *now* on your plan to lower maintenance costs. Write today for 50-page bulletin giving complete information.

Send Today!

For Bulletin No. 405 on Appleton Reelites. Complete information on Constant Duty, Portable, and special types. Or see Sweet's File, page 2a/19.

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CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

be approached with an open mind, and *it must be entered into in the spirit of sincerity and cooperation.*

American ingenuity has faced other problems quite as difficult in the field of technology and has found answers of great value and importance to all of us.

CED PLANS 15 RESEARCH STUDIES

High employment and increasing productivity are goals that the Committee for Economic Development want achieved for the United States. To aid in reaching these goals, CED plans the following studies:

Ways of encouraging the development of small business.

Fiscal and monetary policy to combat inflation and deflation.

Methods of stabilizing the construction industry.

Ways of bringing about a steady flow of investment in business and industry.

Actions businessmen can take in the management of their business affairs to help keep employment high and productivity increasing.

Federal tax policies in labor-management relationships to foster increasing productivity and industrial peace.

Proper wage-price relationships to raise living standards and stimulate production and employment.

Eventually, a summary report will be issued bringing the findings of all the individual studies to bear on the central problem of high employment and increasing productivity.

Businessmen, comprising the research and policy committee, will then translate the studies into policies and recommendations that will have specific application to business and public-organization activities.

For example, the purpose of the labor-management relations study will be . . . "to find a pattern of policies for management, labor, and government that will: (1) avoid interruption to production while management-labor disputes are being settled; and (2) lead to terms of settlement that serve the general public interest as well as the interests of the immediate parties to disputes."

RESULTS OF ANNUAL WAGE PLANS EXPLORED

Guaranteed annual wage plans have a 50-50 chance of survival—or at least that's the score in a recent survey made by the National Industrial Conference Board. Of sixty-one plans examined, twenty-nine are still in operation.

The survey, "Annual Wage and Employment Guarantee Plans," shows that nine of the successes were in the durable goods field, sixteen were in non-durable goods industries, three were in mercan-

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Do you need gears—spur, helical, worm or bevel, of cast iron, steel, bronze or composition? Foote Bros. has been making gears for almost a century—giants 20 feet in diameter to midgets you can hold in one hand.

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Wide experience, broad line and complete facilities make Foote Bros. your No. 1 source for power transmission equipment.

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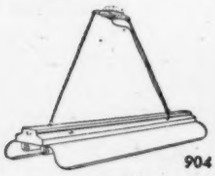
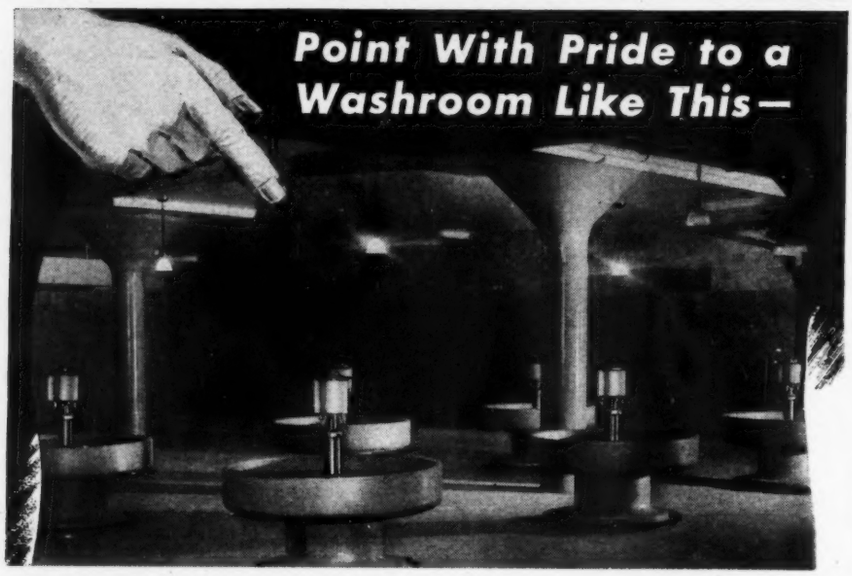
*Patent No. D-141024. Others pending. Underwriters approved.



IT'S EASY TO SEE WHEN IT'S

DAY-BRITE *Lighting*



However, "pointing with pride" isn't the only advantage derived from an installation of modern, sanitary Bradleys. Automatic foot-control and deep, self-flushing bowl allows hands to touch only clean running water. Then, too, one Bradley accommodates 8 to 10 persons simultaneously, cuts water consumption by 75% and reduces piping connections by 80%.

Bradleys can be quickly, easily installed in either new or existing buildings for a long life of economical, maintenance-free service. Write for your copy of illustrated Catalog 4308. . . . Bradleys are nationally distributed through plumbing jobbers.
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BRADLEY *washfountains*

tile establishments, and one was in transportation.

Two of the successful programs have been in effect for twenty years. Most of the discontinued plans lasted less than five years.

Seven of the companies studied point to the depression of the early thirties as their reason for terminating their guarantee plans. Many firms report they can overcome seasonal employment difficulties, but they are baffled in solving mass unemployment problems. In fact, some of the most ardent advocates of the annual wage idea admit that certain industries would be unable to offer an annual wage plan until the problem of recurring depressions is solved.

WAR CONDITIONS BLAMED

Eight plans were abandoned because of wartime conditions, such as government control over materials, labor scarcities, transition of workers, and other wartime problems. In five instances suspension is considered temporary, and the five companies expect to reactivate their programs because they want to support the basic idea of income security for their employees.

The remainder of the thirty-two guarantee-plan failures were discontinued for a variety of reasons, according to the survey.

A study of industries according to type showed that regularized employment is most successfully provided in the consumer non-durable fields—food, clothing, soap.

The employment guarantee and annual wage programs were dropped in the automotive and chemical industries. All but one in the machinery field were discontinued. Five of the eight plans in paper and printing were also abandoned.

The study highlights the fact that pioneer efforts have been made by employers in an effort to provide workers with the advantages of job security.

"The advantages of steady work are self-evident," says the survey. "A wage earner may be paid by the hour, but his needs for food and shelter continue throughout the year, whether he is working or not. Pay by the year enables the worker to budget his expenditures, to purchase a home, and to provide for his children's education. Assured of steady work, the wage earner enjoys peace of mind, and feels that he is needed and wanted."

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Significant because of the influence of proper handling on low production cost will be the first National Materials Handling Exposition, to be held in the Cleveland Public Auditorium, January 14 to January 17, 1947, inclusive.

A major feature of the program will be an exhibit of the latest materials handling equipment. Hoists, hoists mountings, cranes, derricks, conveyors,

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To visualize the importance of adequate wiring, walk down your own production lines, mentally blank out every third worker. Then, check with your plant power engineer, your consulting engineer, electrical contractor or power salesman and make sure there's no such handicap in your plant.

A wiring survey now, may save costly shut-downs and expensive alterations later. 46334

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"Look in there"

BLAW-KNOX ELECTROFORGED STEEL GRATING

hand and power trucks, skids, pallets, tractors, and trailers produced by 32 manufacturers will be on show.

Concurrently with the exposition, materials handling specialists will present a series of prepared papers and lead discussion groups. Fields to be represented include aviation, automotive, beverages, canning, ceramic, chemical, electrical, farm equipment, foundaries, iron and steel, meat packing, paper, railroads, rubber, textiles, warehousing, general machinery, bulk materials, and chain stores.

According to Earl I. Burke of Republic Steel Company, chairman of the policy committee, the exposition will furnish the first opportunity for production, distribution, and warehousing executives to see under one roof all methods of speeding materials along production lines and through plants from receiving depots to shipping rooms.

AN ECONOMIC PLATFORM FOR FREE PEOPLE

DR. H. G. MOULTON, President of the Brookings Institution, addressing the Pennsylvania Water Works Association

A clear and precise perception of our national economy is the essential first step in the formulation of a national economic program. Six goals, it is believed, represent the basic economic objectives in which the American people are interested. . . .

I shall set forth what I conceive to be the primary goals of the American economic and social system:

GOAL I. A Progressively Larger Total National Income

That our aggregate national production is far from adequate to satisfy the needs and desires of the American people is apparent from common observation as well as from statistical evidence. Almost every individual feels keenly that he should have more income in order that he may have a higher standard of living for himself or family.

Every organized economic group in society is constantly striving to increase its income and improve its economic position. Political parties are always committed to a program of greater national income—evidenced by such slogan as "a full dinner pail," "a chicken in every pot and two cars in every garage," "one-third of our population ill-clothed, ill-housed, and ill-fed," and by perpetual promises of perpetual prosperity. The only doubting voice one hears is that of the occasional philosopher or religious leader who expresses the thought that we would perhaps be more truly happy if we were less materialistic and more devoted to the simple life.

GOAL II. A Progressively Wider Division of National Income

The American view appears to be that the gains resulting from technical im-

Save JOB TIME

IN DRIVING SMALL SCREWS

Specify ARO AIR TOOLS

No other tool like it! An *air powered screw driver* for small screws—does a whale of a job speeding up assembly operations!

This sensational new ARO Model 7000 Air Screw Driver is no bigger than the average cigar. Weighs only 8 oz. . . . is 4-⅞" long and ¾" in diameter. Capacity No. 1 to No. 6 screws. Starts automatically — no manual throttle. Drives the screw instantly when tool is applied. *Saves time and cuts costs* in production of radios, cameras, electrical appliances, instruments, recording devices, optical frames, typewriters, light fixtures, fishing reels, plastic products, automatic counting devices, speedometers, thermostats, electronic controls, many other products.

For many other jobs of screw-driving, nut-setting, drilling, grinding and similar production work . . . there's an ARO Tool to do it faster and better! Precision-built . . . proven dependability. Write for catalog. The Aro Equipment Corporation, Bryan, Ohio.

SEE YOUR ARO JOBBER!

provements and increasing efficiency in production should accrue in large measure to the masses of the population. That is, we wish to see a progressively broader distribution of income among the many rather than increasing concentration in the hands of the few. Such a goal meets the approval of the masses for the obvious reason that it benefits them directly. But there are also reasons why it commands the support of all classes.

First, larger incomes make—within broad limits—for individual efficiency. The evidence afforded by health tests and army examinations reveal that a substantial proportion of the American people are still on a plane of living too low for health and efficiency.

Second, a broad distribution of national income is essential to the economic growth of the nation as a whole. The continuous expansion of industry, agriculture, and mining depends upon *markets*, and our only permanently expansible markets are those which are found in the unfulfilled desires of the great masses of the people.

Whether the stimulus to economic growth springs from expanding mass consumption or from preceding capital development, there can be no doubt that the wants of the masses constitute the primary ultimate markets. What we are interested in is a dynamic, growing society; and maximum growth is dependent upon a progressive expansion of the buying power of the great body of consumers.

GOAL III. A Society in Which Individual Rewards are Based Primarily on Work Performed

It has always been a principle of the system of individual enterprise that the individual should be paid for what he does, and not according to his needs. A national goal of rewarding each individual without reference to the work performed appears so repugnant to the basic thinking of the American people as scarcely to require comment.

It should be observed, however, that the proposition that rewards should be directly related to productive contributions is not a capitalist doctrine merely. The Socialist party does not advocate the communal idea of equal pay regardless of productive output. Nor does the present day Communist party. The Communist, to be sure, long extrolled the doctrine: "From each according to his ability; to each according to his *need*." But experience in Russia demonstrated that this principle and human nature do not work well together. Lenin eventually referred to this principle as a "childhood disease of communism." And in the constitution of the U.S.S.R., Article XII, appears the following principle: "From each according to his ability; to each according to his *work*."

IT CAN HAPPEN

in YOUR *plant*

IF YOU DON'T SPRINKLE

QUIK-SIL

TRADE MARK

The Modern

OIL AND GREASE ABSORBENT

ON OILY, GREASY FLOORS

Now . . . with production volume vitally important you can't afford to gamble with lost manpower hours from floor slipping accidents. QUIK-SIL dries oil and grease with amazing speed. Gives safe footing for workers and makes floors safer for power trucking. Increases leather belting life. Won't harm shoe soles and heels, clothing, hands, floor surfaces. Makes floors easier to clean.

Make Your Own Test with

FREE SAMPLE

Just sprinkle QUIK-SIL on an oily spot and note its quick-drying action. Then test the surface for surer footing. Write now!

TROJAN PRODUCTS DEPARTMENT

The Diversey Corporation

53 W. Jackson Blvd., Dept. S-9, Chicago 4, Ill.

Prompt deliveries

both types!

WIREGRIP Belt Hooks that can be applied with any make lacing machines, have double (patented) aligning cards that hold hooks in perfect alignment, prevent handling and card-end loss—every hook saleable and usable. Made in 6 sizes.

STEELGRIP Belt Lacing is applied with a hammer. Comes in 11 sizes, in standard boxes, handy packages or long lengths for wide conveyor belts. Have 2-piece hinged rocker pins.

Write for Catalog

ARMSTRONG-BRAY & CO.

"The Belt Lacing People"

5338 Northwest Hy., Chicago 30, U.S.A.

Widely Used to Keep Count!

Industry's favorite "Watchdog of Production" since 1906 . . . Redington Counters are *widely used* on punch presses, pumps, screw machines, packaging machines . . . conveyor lines, can making and box making machinery . . . in fact *all types* of machinery . . . and production lines. Easy to install . . . *100% accurate*. Write for new catalog.

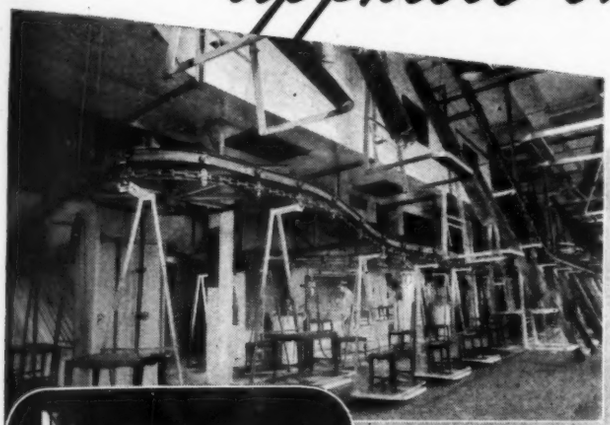
F. B. REDINGTON CO.

105 S. Sangamon St. Chicago 7, Ill.

The finest quality finishes are applied on

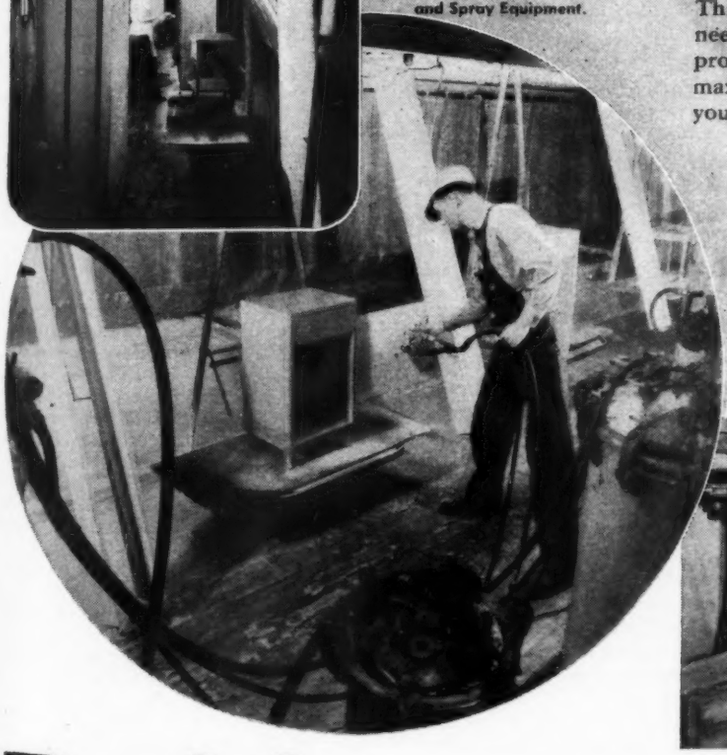
Permanized **MENGEL** *Furniture*

the Modern DeVilbiss Way...



● Station 7 at left and Station 8 at right—Complete DeVilbiss installations. First and second top coats are applied at these stations.

● Station 3—Operator applies wash coat. Note DeVilbiss Exhaust Booth, and Spray Equipment.



Mengel Company of Louisville, Ky., employs automotive production techniques and a completely conveyorized assembly line 2½ miles long to build their *Permanized* furniture. Twenty manufacturing steps, including 8 separate fine finishing operations are done at DeVilbiss stations on this moving conveyor. Ten hours and 54 minutes are required to complete the cycle. Fifty three-piece bedroom suites are completed every hour and the assembly line handles ten carloads of furniture at one time.

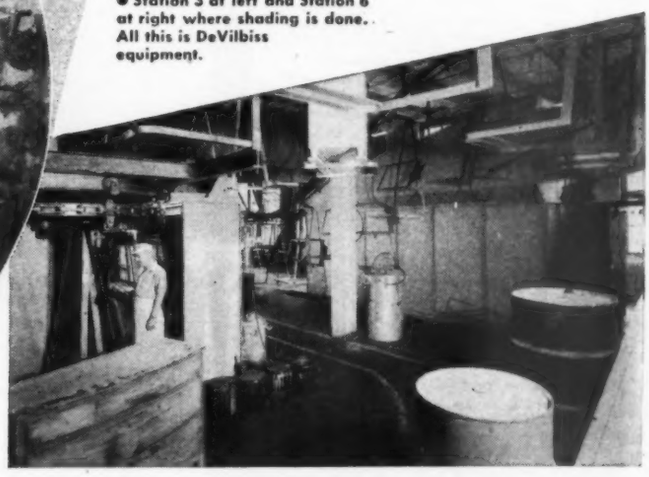
Here at Mengel Company, just as in other major industries throughout the world, DeVilbiss equipment is used exclusively to apply the beautiful, durable finishes that guarantee genuine eye appeal and increase sales.

This is another noteworthy example of DeVilbiss Engineering skill and experience that can solve your finishing problems, whatever they may be. If you are not getting maximum speed and high quality finishes at low cost, give your DeVilbiss engineer an opportunity to help you.

THE DEVILBISS COMPANY, TOLEDO 1, OHIO
CANADIAN PLANT: WINDSOR, ONTARIO

● Station 5—A DeVilbiss Water-Wash Exhaust System where a sealer or glaze coat is applied.

● Station 3 at left and Station 6 at right where shading is done. All this is DeVilbiss equipment.



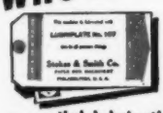
DE VILBISS

means **Quality** *in all four..*

SPRAY EQUIPMENT
EXHAUST SYSTEMS
AIR COMPRESSORS
HOSE & CONNECTIONS

NOW

WHO'LL LUBRICATE IT?



The LUBRIPLATE Tag Service assures the machinery manufacturer, who uses LUBRIPLATE for initial lubrication, that the machines will be serviced with the same outstanding lubricant. Machine Builders, use the Tag Plan. Machine users, mail the post cards you find on the equipment.

℞ FOR YOUR MACHINERY

No. 3 — Ideal for general all type lubrication, ring oiled bearings, wick feeds, sight feeds and bottle oilers.

No. 8 — Because of high film strength and long life it reflects outstanding performance in most types of enclosed gears (speed reducers).

No. 107 — One of the most popular grease type products for general application by pressure gun or cups.

No. 70 — For a wide range of grease applications, especially at temperatures above 200 degrees F.

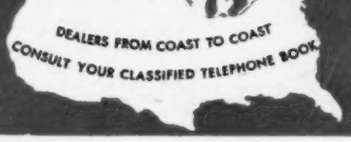
No. 130-AA — Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

BALL BEARING — This is the LUBRIPLATE Lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.

LUBRIPLATE

FISKE BROTHERS REFINING CO.

NEWARK 5, N. J. TOLEDO 3, OHIO



GOAL IV. Increasing Economic Security

Economic *in*security is a product of the modern highly developed industrial era. The agricultural pioneer, the mediaeval feudal serf, and the slave all possessed economic security—at some level. But the free and independent worker of the modern age has long been faced with periodic loss of income in consequence of periodic fluctuations in the labor market. The problem has been greatly magnified by the profound economic changes of the last fifteen years, as a result of which unemployment on a large scale has seemed to be chronic in character.

A greatly increased measure of individual economic security is regarded as a goal of primary importance. Without reasonable stability of income, no one can make adequate provision for the hazards of sickness and the requirements of old age, or plan personal and family development programs with any assurance that they may be carried out.

The recent establishment of the *social* security system was a recognition of the importance of providing, through the agency of government, a minimum of economic security for certain classes of people. Similarly, present-day emphasis upon the restoration and maintenance of a state of full employment evidences a conviction that the provision of the *individual* security which flows from steady employment is a paramount requirement.

GOAL V. The Greatest Possible Development of the Capacities of every Individual

An economic system which stultified the individual and resulted in human deterioration would obviously not be acceptable to the American people. The system must rather provide a stimulus to individual initiative and promote the development of latent capacities. Such a system aids directly in achieving that expanding national production upon which the realization of progressively higher standards of living depends.

This goal is of the very essence of democracy, the strength of which is directly dependent upon the power of the individual units of which it is composed. It is, moreover, essential to the achievement of that self realization, the desire for which is so deeply ingrained in human beings.

Human intelligence applied to the processes of production under favoring conditions constitutes the ultimate basis of economic advancement. With this in mind, we have provided a vast free elementary and public school system, supplemented by extensive vocational education programs, and also by subsidized institutions of higher learning. In short, we endeavored to give everyone the best possible training, mental and physical, with which to realize his personal potentialities.

Closely related to—indeed, an essential part of—the principle of individual de-

YOU CAN BE SURE OF CORRECT LUBRICATION OF YOUR MACHINERY

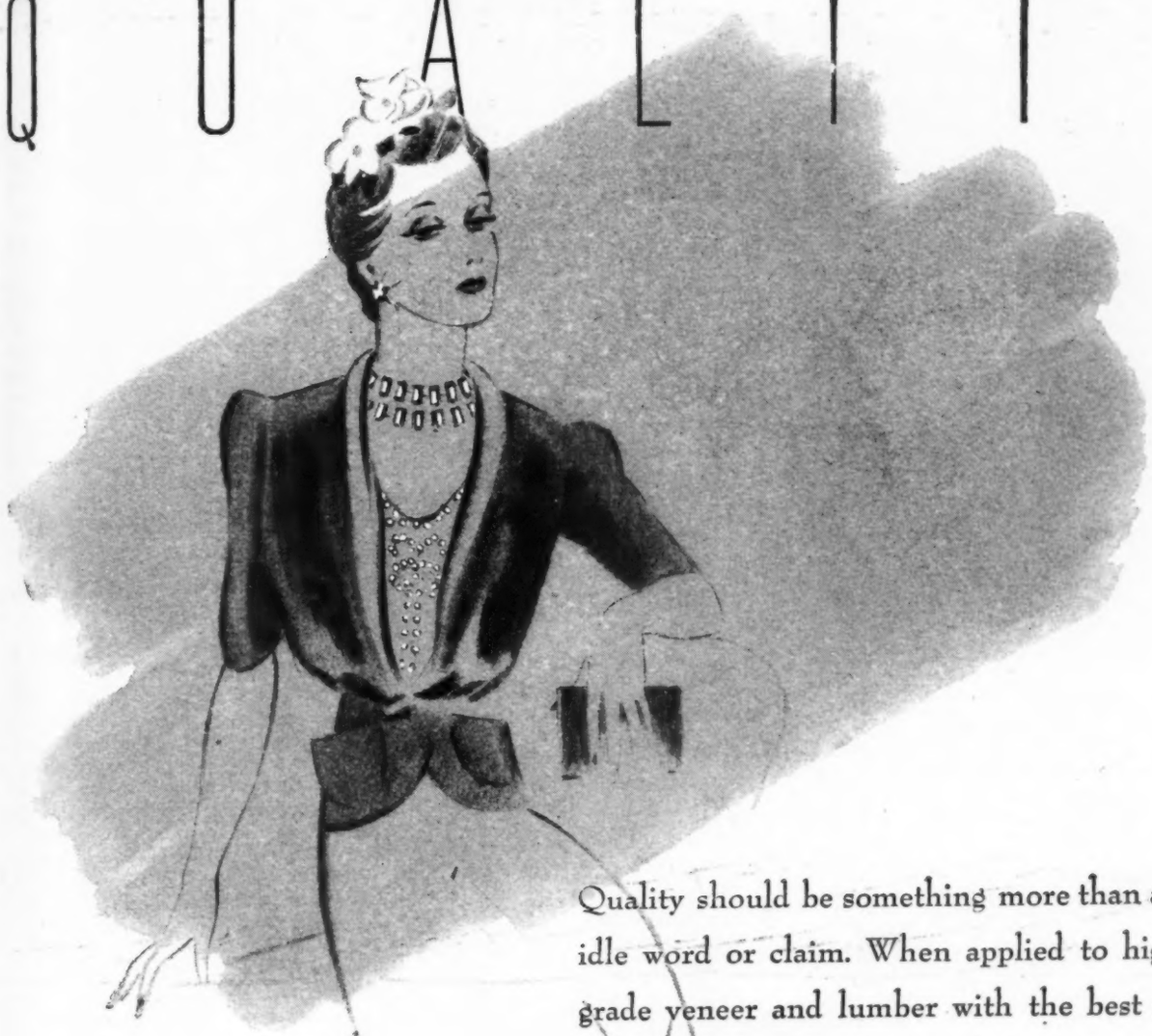
Machinery manufacturers go to great lengths in selecting lubricants that will assure the most satisfactory performance of the machines they build. Initial lubrication at the manufacturer's plant, however, will only affect the first stages of the machine's operation. Once the machine is sold or rented, subsequent lubrication will naturally influence the performance of the machine. Any excessive wear, malfunction, or frequent breakdowns of a machine, often due to faulty lubrication, will prove costly to the machine user and will reflect back on the machinery manufacturer.

Proper initial lubrication of machinery is undeniably important. But of even greater importance, especially to the machinery manufacturer, is the maintenance of original standards of lubrication in the field. To back up machinery manufacturers who use LUBRIPLATE for initial lubrication the "TAG PLAN" has been developed. It assures proper lubrication of Machines in Use. Before a machine leaves the manufacturer's plant a "tag" is attached. It fulfills three functions . . . advises proper type of LUBRIPLATE to be used . . . explains why this lubricant should be used for relubrication . . . provides postal for locating nearest LUBRIPLATE dealer.

When one of the tagged machines is delivered, the receiver and future user of the machine detaches postal from the LUBRIPLATE tag, leaving on the machine information about type of LUBRIPLATE recommended and points of application. He then mails the postal inquiry card to Fiske Brothers Refining Co. On receipt of this postal, they do two things. 1. They notify the nearest LUBRIPLATE dealer of this new machine in his territory. 2. They write to the machine user, giving him the name of his LUBRIPLATE dealer. Thus the machine user meets the LUBRIPLATE dealer and the manufacturer of the machine can rest assured of proper relubrication of the equipment.

Scores of machinery manufacturers have adopted LUBRIPLATE for the lubrication of their equipment because of LUBRIPLATE'S exceptionally high film strength, stay-put qualities, long-life, and its water, steam, and acid resisting properties. Since using LUBRIPLATE they have been able to guarantee smoother, more quiet performance, and longer life for their equipment and, therefrom are assured of valuable customer satisfaction. Adv.

QUALITY



Quality should be something more than an idle word or claim. When applied to high grade veneer and lumber with the best in steel wires, fabricated on modern equipment by experienced craftsmen . . . the result is SUPERSTRONG — "Bound with Steel."

If you are interested in incorporating SUPERSTRONG quality in your long range requirements, we wish you would let us hear from you.

SHIPPING TRADE SUPERSTRONG MARK CONTAINERS REG. U.S. PAT. OFF.

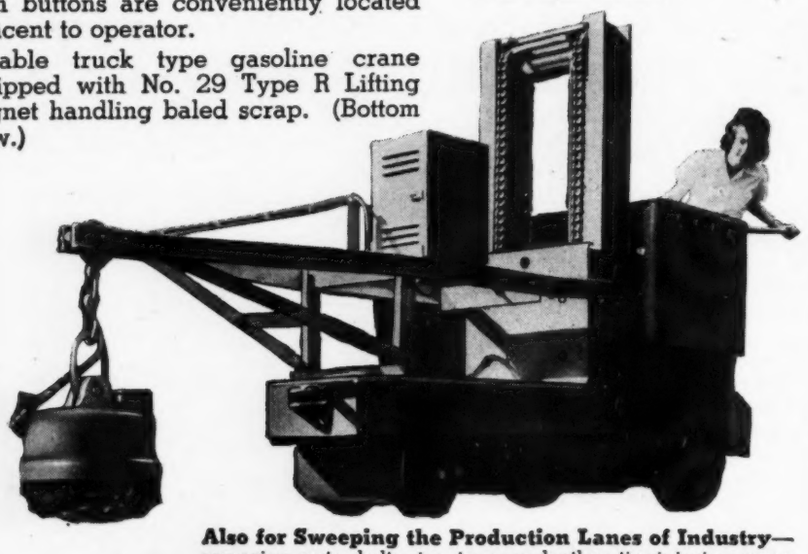
RATHBORNE, HAIR AND RIDGWAY COMPANY

1440 WEST 21st PLACE • CHICAGO 8, ILLINOIS

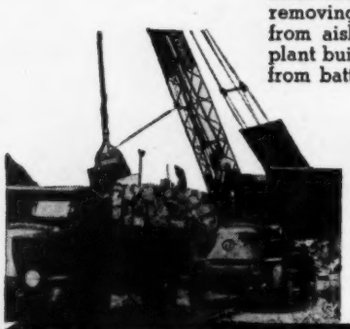
For Lifting Loose or Baled Scrap—a mobile unit. Boom can be retracted and lowered to enter box cars for loading or unloading finished material. 36-volt power-generating unit on truck crane supplies direct current for this 29-inch diameter magnet. "Lift" and "Drop" push buttons are conveniently located adjacent to operator.

For Lifting Castings or Forgings — reaching into remote corners of a plant, this 29-inch magnet receives power directly from crane truck.

Portable truck type gasoline crane equipped with No. 29 Type R Lifting Magnet handling baled scrap. (Bottom View.)



Also for Sweeping the Production Lanes of Industry—removing nuts, bolts, turnings, and other tire-injuring scrap from aisleways, between machines, from roadways, between plant buildings, etc. This 18-inch diameter magnet is operated from battery of standard high-lift truck.



EC&M Magnets Come in 10 Sizes for All Needs. Bulletin 900 gives complete data and shows many interesting installations. Bulletin 910-2M gives road-sweeping magnet information. Send for copies.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

velopment is the conception of free choice in economic affairs. Except in time of war, the individual is under no compulsion with respect to the type of economic activities in which he may engage. Everyone has the right to determine for himself what kind of occupation or career he wishes to follow, and to acquire such training as may be necessary. He has the right to quit his job if he does not like it or thinks he can better himself elsewhere. He has the right to shift from one occupation to another. He has the right to move from place to place if he thinks he can improve his position by so doing. He has the right to decide for himself for what purpose he should use his income. This lack of compulsion by external authority applies equally to laborers, professional groups, and businessmen both large and small.

GOAL VI. Opportunity for Every Capable Individual to Earn His Own Income

Self-help has always been regarded as a cardinal principle of the American system. Instead of a situation in which large numbers of people are dependent upon the state or charitable institutions for economic support, we covet a society in which every individual who is not physically or mentally defective shall have the opportunity to *earn* his own living. The poorhouse and the dole, necessary though they may be, are not satisfactory substitutes for remunerative work.

A remunerative occupation appears indispensable to the maintenance of individual self-reliance and to the development of latent capacities and talents. It is likewise indispensable to the self respect and personal independence of the individual citizen, so essential to a virile democracy. Without adequate work opportunities our society will deteriorate physically, mentally, spiritually, and politically, as well as in terms of material wealth.

•

Everybody talks of shortages, but of one thing we have an over-supply—namely, economic screwballism.—**WILLIAM K. JACKSON,** National President, Chamber of Commerce of the United States.

•

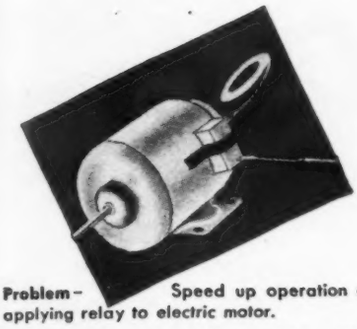
DISCUSSING WAGE PLANS AND PUBLIC RELATIONS

(Portions of three significant speeches delivered at the recent Industrial Relations Conference of the American Management Association)

SHARING COST SAVING BOOSTS PRODUCTION

DAVID W. RUST, Vice-president, Bundy Tubing Company, Detroit

We still consider our cost savings sharing plan in the experimental stage, although it is apparently successful after

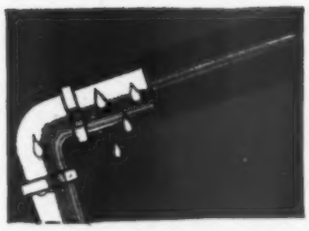


Problem — Speed up operation of applying relay to electric motor.

Solution — Relay is quickly taped in position with Self-Stik Mystik Tape, leaving both operator's hands free to attach screws, permitting fast assembly-line operation.

Problem — [illegible] protect gleaming surface of auto bumper against mars and scratches from assembly line to showroom floor.

Solution — Mystik MASK applies easily, instantly; provides sure protection; peels off clean.



Problem — Eliminate condensation on cold water pipes and dripping with resulting damage to machinery, storage, materials, etc.

Solution — Mystik Self-Stik DRI-PIPE stops pipe drip positively. A combination of thick insulation and waterproof tape, it applies easily, quickly to pipes without tools.

Methods *by Mystik*

Problem — A fast, sure method for separating colors in painting — as on autos, streamline trains, buses, planes, etc.

Solution — The new, improved paper masking tape by Mystik. Self-Stik adhesive holds sure against bleed with only a touch; peels off clean; makes curves and accurate straight lines easy; thin paper prevents paint build-up at edges.

●There are thousands of better methods for solving problems in industry with Mystik Adhesive Products. These "Mystik Methods" are speeding production and cutting costs in plants everywhere. Why not let us show you how Mystik will apply to dozens of your production, maintenance and shipping operations.

Mystik comes in many forms — MYSTIK SELF-STIK TAPE, cloth or paper, up to 36" wide — MYSTIK MASK, a reinforced paper material for protecting fine surfaces — MYSTIK SPRA-MASK, a fast method for stencil spray-painting designs and insignia — MYSTIK SAND BLAST, a protective covering for sand blasting glass — MYSTIK DRI-PIPE, an insulation to stop pipe drip — MYSTIK-PRINT, for Self-Stik labels and signs.

★ ★ ★

FREE — *Send for Mystik samples and interesting new booklet showing how Methods by Mystik can cut costs in your plant. Mail coupon to — Mystik Adhesive Products, 2642 N. Kildare, Chicago 39. Sales offices in major cities. Export office, New York City. Canada — G. A. Moggridge Co., Ltd., St. Catharines, Ont.*

Mystik Adhesive Products, 2642 N. Kildare, Chicago 39.

SEND *FREE* BOOKLET AND FOLLOWING SAMPLES:

☐ Mystik Cloth Tape; ☐ Mystik Waterproof Cloth Tape;
☐ Mystik Mask; ☐ Mystik Spra-Mask; ☐ Mystik Sand Blast;
☐ Mystik Paper Masking Tape; ☐ Mystik Dri-Pipe; ☐ Mystik-Print.

Name_____ Title_____

Company_____

Address_____

MYSTIK
ADHESIVE PRODUCTS
"ANYTHING THAT STICKS

a six months' trial. Wages, prices, and demand have been increasing, so we do not know the answer if the reverse were true.

Since abandoning piece work before the war, we have watched our efficiency decline to about 55 percent of what it was in 1937. The union was introduced into our plant in 1938, and since then a ceiling was placed on individual effort and initiative. The slogan was "more pay and less work." Thanks to a fine staff of engineers and research men, we kept ahead through technological changes, together with more efficient methods and operations.

Back in January and February, the union was demanding a 30 percent increase in rates. We told them we could not possibly increase wages without a commensurate increase in production. In the final negotiations of the plan as adopted, we agreed to a guaranteed 18½-cent increase in base rates, which followed the pattern of increases granted in our industry. You are no doubt familiar with the very strong CIO policy against incentives, where one worker is pitted against another—the slow against the strong. This was given due consideration in our plan, the result being that everyone participates equally.

A formula was set up on the relationship of the hourly labor cost to the sales dollar. The standard selling price of our product was established as of the date of the introduction of the plan, and remains constant. Any OPA relief in our selling prices would not be considered in the earnings under the plan. The sales dollar is the value of goods produced as they leave the shipping room, or as they are placed in finished goods inventory. Labor costs include all hourly wages except salary, overtime and night premiums, vacation allowances, wages paid on capitalized items, and a few more things.

The ratio was determined by actual operating figures from October 1, 1945, to January 22, 1946, a 16 weeks' period. Over this period it was found that the hourly labor portion was about 30 cents of the sales dollar, and this figure was used as the basis of our formula under the plan. The saving in labor costs arising from more productivity per individual is split evenly between the company and labor.

If the same working force produces more sales, the proportionate saving of labor cost on the additional sales constitutes the earnings of both the company and labor under the plan. The employees' shares are paid to them at the end of each quarter, and each quarterly period stands on its own. That is, if a quarterly figure should end in the red. this red figure would not be carried over in computing our next quarter. We start each quarter with a clean slate.

EXTRA EARNINGS

To express this in another way, let us use some hypothetical figures. Let us assume that this month's hourly wages were $210,000, and last month's hourly

• • • *By Using a Hoist That Stays On The Job Longer—With Fewer Moving Parts To Maintain!*

There are only four moving parts in the hoisting unit of a *Reading* Electric Hoist. To you this means fewer wearing parts—lower replacement costs. And because each of the hoist units can be individually removed for routine inspection or overhauling, maintenance time and expense are kept at a minimum.

Decide today to get fast, low-cost material handling with *Reading* Electric Hoists. Contact your nearest *Reading* Hoist distributor, now. Also, drop us a line for your free copy of "144 Answers To Your Hoisting Problems."

READING CHAIN & BLOCK CORPORATION
2103 ADAMS ST., READING, PA.
CHAIN HOISTS • ELECTRIC HOISTS
OVERHEAD TRAVELING CRANES

READING HOISTS

Pay Check—

WORN on a LAPEL!

One of the strongest labor-management links is the appreciation shown by employers for loyal, conscientious workers. That appreciation takes tangible, attractive form in Robbins Service Awards.

Industries of all types report that a Robbins Service Award System stimulates pride, encourages constructive thinking, better workmanship, helps immeasurably to sustain high morale.

Robbins Service Awards are practical "pay checks" that repay employers in many beneficial ways. A representative will be happy to show you how they can help in your business. Estimates and design suggestions submitted without obligation.

The Robbins Co.
ATTLEBORO, MASSACHUSETTS
"IDEAS IN METAL"

IMO PUMPS

PERMIT DIRECT DRIVE AT ANY SPEED

The IMO pump can be connected directly to turbines, motors or other machinery without the use of reduction gears.

Operated at high speed, it is exceptionally small and compact in proportion to its capacity.

IMO pumps can be furnished for almost any capacity and pressure required for pumping oil, hydraulic control fluids and other liquids over a wide viscosity range.

For further information send for catalog I-138-J

IMO means MOVE OIL
IMO PUMP DIVISION
of the
DE LAVAL STEAM TURBINE CO.
TRENTON 2, NEW JERSEY

BWH

DEPENDABLE RUGGEDNESS

HOW TO GIVE A DAM A FACE LIFTING

USE BWH AIR DRILL HOSE

One of the country's big dams needed a new concrete facing. But before it could be applied, the wall had to be "roughed" with compressed air . . . to give it an irregular pattern that would hold the new concrete.

The air hose selected for this job had to withstand high pressures, the oil and heat of compressors, and the constant impact of jagged edges of broken concrete. Naturally, BWH BAY STATE Air Drill Hose was the contractor's choice. This quality air hose is made with the highest grade oil-resistant tubing and has multiple plies of heavy cotton duck set in strong, flexible rubber for added ruggedness.

When next you need heavy-duty air hose, look to BWH for dependable ruggedness . . . BWH distributors for dependable service.

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems . . . we're specialists in solving them. Consult your nearest BWH distributor, or write to BWH direct.

BOSTON WOVEN HOSE & RUBBER COMPANY

Agents in All Principal Cities

WORKS: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

Better Grinding

★ Greater Production

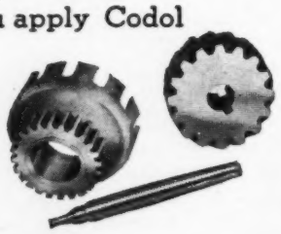
★ Finer Finish

★ Longer Wheel Life

...by the barrel

CODOL Liquid Grinding Compound has often proved to be the primary factor in turning an unacceptable performance into a complete success. One user says: "When Codol replaced another fluid for grinding a crankshaft, wheel life jumped from 14 to 20 pieces and gumming disappeared." Says another: "Of seven compounds tested, Codol produced the best finish." And another: "Since standardizing on Codol for surface grinding, wheel and segment life has improved and rusting has been eliminated."

A Stuart Engineer will help you apply Codol to your advantage, whatever your grinding problems may be. Ask him to visit you.



Write for "Up-to-Date Grinding Practice"

D.A. Stuart Oil CO. LIMITED
EST. 1865

2735 SOUTH TROY STREET, CHICAGO 23, ILL.

Stuart Oil Engineering Goes With Every Barrel

wages were the same—$210,000. But this month's sales were $840,000, compared with $700,000 last month, or a gain in sales dollars of $140,000 without any extra labor cost. Using our 30 percent factor, we multiply $840,000 by 30 cents, arriving at $252,000, which is the allowance on hourly rated labor for this month. We then subtract the $210,000 actual wages paid from the above, which leaves $42,000, which is the plant's gross earnings. To determine each employee's share, the worker's half, $21,000, is divided by the total number of hours worked—say 160,000 hours—resulting in 13.1 cents an hour extra for each hour the employees worked.

During the quarter April through June, we worked 528 regular hours and the average earning under the plan was 22.4 cents an hour. This resulted in a possible bonus of $118.27 for those who worked every hour during the three month's period.

The figures per hour are those arrived at after the employees have received the 18½-cent guarantee in their base rate. In other words, they are earning over 40 cents an hour more than they did before the plan was adopted.

There were 1178 people eligible to participate in the plan. We guessed that possibly 18 or 20 would have worked the full 528 hours. Not so—there were 197 workers, or 16.6 percent, who had neither missed a day nor been late during that period.

Shortly after V-J day we went to 40 hours. I have taken the figures from the period on which we formulated our plan, October, 1945, through January, 1946, to compare with the period our plan has been in force to determine percentages on absenteeism.

During the first period, October through January, 9.3 percent of the workers were absent. While the plan has been in effect, April through August, a total of 6 percent were absent, or a decrease of 35½ percent.

For many years we have used the rough formula that so many hourly employees would produce a like number of tons per month. That is, 1000 employees would turn out approximately 1000 tons a month. Since our plan has been in operation, an average of 1.45 tons per employee per month has been produced. Our over-all efficiency before we started the plan was 55 percent. By the end of August it had risen 60 percent, which means that we are now operating at 88 percent efficiency. This increase is due mainly to the workers cutting down on loafing, spending less time in the wash rooms, and not stopping work before the bell. There has been no speed-up or extra exertion. They have found that a little extra effort could easily net them 30 cents an hour.

Copies of the plan were given to the international union representative, who in turn gave them to their research department and to high officials in the union. The report came back that our plan conformed with their policies and bore their stamp of approval.

CATERPILLAR TRACTOR CO. says:

"The Best Treatment for Accidents is Their Prevention"

CATERPILLAR TRACTOR CO. uses...

A-O Safety Goggles

Caterpillar Tractor Co. supplies A-O Safety Goggles to employees on eye-hazardous jobs. As illustrated, they service and repair goggles right at the worker's machine, through goggle service carts manned by specially trained experts. As a result of their eye protection program, the cost of eye injuries in this Peoria plant has been materially reduced.

Your nearest A-O Safety Representative will be glad to arrange for an eye hazard survey of your plant, at no charge, and to help you set up a complete eye protection program.

American Optical COMPANY *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS
BRANCHES IN PRINCIPAL CITIES

IT'S A GREAT HACK SAW BLADE

THIS MILFORD FLEXIBLE REZISTOR!

SAFE...
Replaces all hard blades for all users . . . skilled or unskilled

ECONOMICAL...
Delivers full cutting life . . . no accidental breakage

- **Cannot break or shatter in the frame.**
- **Faster and greater production per blade.**
- **Made from a new high-speed steel for longer cutting life. Only the teeth are hardened . . . the back is tough and flexible.**

Plus

"EASY-STARTING TEETH" IN ALL HAND SIZES . . . EXCLUSIVELY MILFORD.

Order from your mill supply distributor. He is always ready to serve your needs for all factory and mill supplies, as well as Milford hack saw and band saw blades.

MILFORD FLEXIBLE REZISTOR is the answer to your HACK SAW cutting problems

MILFORD PROFILE AND BAND SAW BLADES REZISTOR AND DUPLEX HACK SAW BLADES

THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively for Over 65 Years
NEW HAVEN 5, CONNECTICUT, U. S. A.

The stewards are constantly on the alert for bottle necks in the flow of material, machine break downs, or other difficulties caused by poor supervision. This is good. If material is returned for rework we get holy-hell. We have had a case of hair pulling because one girl did not come up to another girl's idea of getting out production on a line job. One of our stewards was himself on the spot because of loafing.

MANAGEMENT'S MESSAGE LACKS ESSENTIAL FACTS

MARTIN DODGE, Partner, Dodge & Mugridge, New York.

If you canvass industry in an effort to seek agreement on the question of what management's message is, the highest common denominator you can obtain will still be so low that it will be innocuous. In a given plant the problem becomes simplified, though still difficult. The desire will be to clarify controversial questions, but in many cases after these have been spelled out on paper and watered down to a form approved by management and legal counsel, they become about as effective as a nursery rhyme.

Employees are interested in information, not propaganda or argument. Few people in this world ever really won an argument. Argument only results in generating adverse emotions.

Tell the facts, for instance, about profits, 4 percent of the sales dollar and not 60 percent as many believe. Tell the facts about wages and salaries—87 percent goes to wages, only 13 percent to salaries, not the reverse as some employees believe. Make that 87 percent as high and clear as the Washington Monument. Time pronouncements to spike rumors. Let the employees in at the earliest possible moment on the company's future plans. Their security is at stake. Uncertainty and worry mean inefficiency.

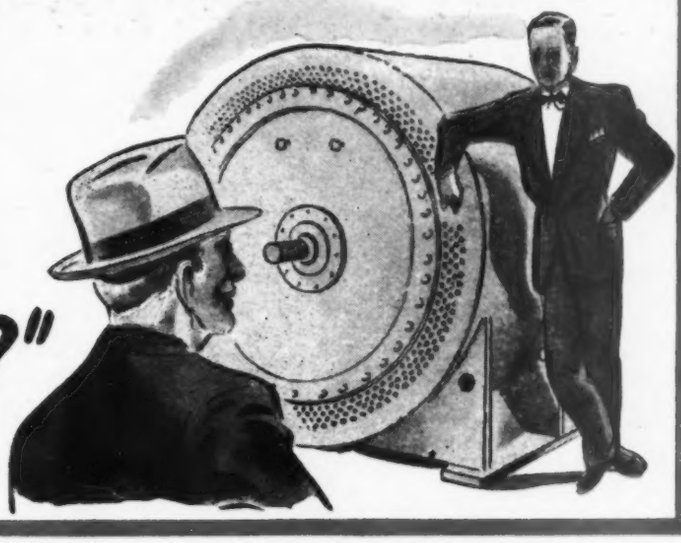
A comprehensive poll recently taken among workers in one of our very competitive industries but not yet made public indicated that a substantial percentage of them think that this industry is a monopoly, and is therefore free to set such prices and make such profits as it wishes. When such erroneous notions prevail, is it any wonder that when The Psychological Corporation put the question "If all manufacturing companies were run entirely by the government, would you get more for your money than under the present system?" 43 percent of those queried said "More," or at least "As much." Has management so failed to get its message across that we are within 8 percent of voting the American system of free economy out of existence?

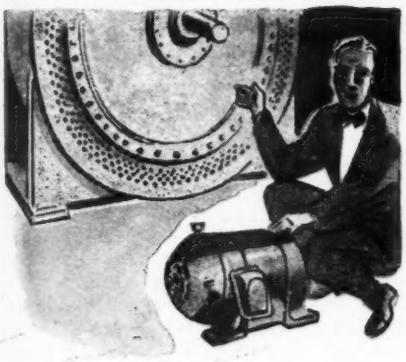
PERSONNEL ADMINISTRATION'S STATUS IS RISING

GUY B. ARTHUR, JR., Vice-president and Director, The American Thread Company, New York.

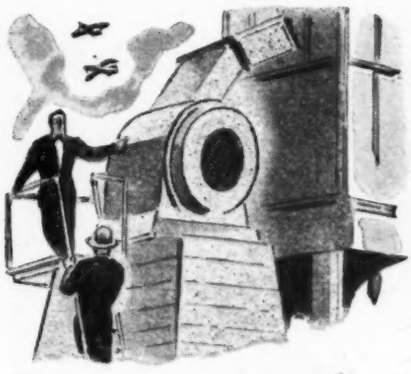
(The following is the conclusion of Guy Arthur's address)

"Did You Say, Up to 2000 hp ...Weatherproof?"

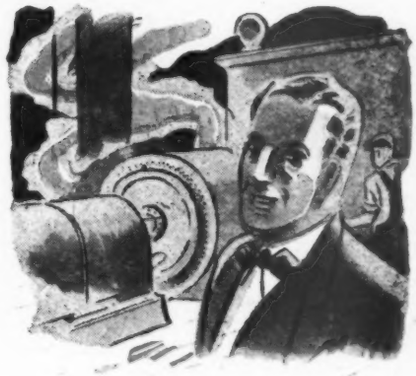




"Right. In Allis-Chalmers' modern motor line we're now prepared to offer you a *complete range* of outdoor weatherproof, totally-enclosed motors all the way from small, standard ratings to sizes of 2,000 hp or larger."



"Why, That Means Then," our customer exclaimed, "in larger ratings they fill the need of power plant engineers who want to install equipment like draft fans *outside,* and thus keep down structure costs per kw capacity." Right again —and they fit into *other* industries too!



Chemical, for instance. Here cast iron motors have generally been preferred ... because they stand up better under acid and alkali conditions. But now these *new* motors, with *new* design improvements, promise to provide several important operating advantages ...

We've Re-designed the heat-transfer system to *improve ventilation.* We've *reduced maintenance* by making air passages not only more accessible, but practically *self*-cleaning as well. And we've *eliminated* liquid and dirt-trapping pockets. In the smaller ratings we of course offer our standard design.

Looking for a Good Motor?

SPECIFY "Allis-Chalmers"! For whether your job calls for a large motor like that above, or a small standard machine, you can be sure of getting two things when you specify "Allis-Chalmers:" 1) Exactly the right type and size motor; 2) consistent with the finest quality workmanship of which we are capable.

For the full story of liberal Allis-Chalmers motor construction, call our nearby dealer or sales office. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2117

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

"WHY CAN'T FOLKS GET ALONG BACK THERE?"

Kansas people are accustomed to work . . . work before pay. Rural in origin, they realize that harvest follows effort and that the bounty of the harvest is not greater than the effort and planning that precede it.

It may be environment, it may be heredity. But the people of Kansas . . . sons and grandsons of sturdy pioneer settlers . . . are prone to do their own thinking. They simply cannot understand how independence of personal decision can give way to acceptance of ideas and theories advanced by some radical leader. They prefer logic and reason rather than mass emotion and radicalism. You can depend on Kansas labor.

FOR INSTANCE...

Kansas has never experienced a general strike. And with the exception of local work stoppages of short duration there has not been a serious strike in this state for more than a quarter-century.

You will find much of interest in the brochure
Let's Look Into Kansas
Ask for it on your letterhead

KANSAS INDUSTRIAL DEVELOPMENT COMMISSION

William E. Long, Secretary-Director
809-A Harrison Street Topeka, Kansas

KANSAS * REALLY MEETS INDUSTRY HALF WAY

Personnel administration has improved its position, over the years, by virtue of its ability to hold down or to reduce costs.

There is a greater interest in personnel administration than ever before in our history, though still much room for acceptance into top management circles.

The attitudes of workers have changed materially, and as a result we have a big educational job on our hands.

Efficiency in production must be regained, and good personnel administration will make this possible of accomplishment without seriously jeopardizing our economic system.

Research is badly needed to dig out and make available the facts regarding personnel administration and human behavior.

Executive development is a management *must*, and more emphasis should be placed on the understanding of people, as well as on the techniques of personnel administration.

The need for a bumper crop of top personnel men today is a great handicap to industry as well as to the personnel profession.

Our commission system with employees must be restored on the small company basis by using the foremen as a part of management.

Management objectives and policies must be put into writing.

Arrangements should be made to keep policies ahead of developments. This is especially true in the field of labor relations if we are to prevent even greater industrial and economic strife than we have seen.

Industrial leaders today have a golden opportunity to win America's enduring gratitude by working out a labor-management code that will end industrial strife.

A READER COMMENTS ON TWO RECENT ARTICLES

(The following letter was sent to the editor by the personnel director of a large Eastern manufacturing concern. The two articles referred to are: "Does Your Community Like Your Company?" *(August, 1946, Page 128)*, "Why Output Per Man-Hour Must Go Up" *(August, 1946, Page 82)*

In the small midwestern community where I lived some 23 years ago, there were two steel rolling mills. One was a small independent outfit, and the other, similar in size, was a unit of a well-known chain of plants. I was employed at different times as a workman in both plants. The pay scales were the same. Yet, for some reason or other, the chain plant was generally rated a better place to work than the independent plant. Being quite young, I never gave much thought then to the reason, but simply accepted as fact this idea that the one plant was a better working place than the other.

As I look back now it seems that the reason for the preference was concerned

CHECK THE FEATURES YOU WANT IN A WORK-BENCH .. YOU'LL FIND THEM ALL IN HALLOWELL

RIGHT SIZE

"Hallowell" ready-made Work-Benches are made in five heights and widths and in seven standard lengths from 3 to 10 feet. Any number can be joined end to end for a continuous work-bench. 1367 combinations available.

CONVENIENCE

Pilfer-proof drawer units, shelves, cabinets, etc., are available to make the benches fit the job. Prices and deliveries are right.

STURDY CONSTRUCTION

Constructed for long wear and made to stand firm and rigid without costly, time-taking bolting to the floor.

Write for the free "Hallowell" Catalog of Shop Equipment. "Unbrako" and "Hallowell" products are sold entirely through distributors.

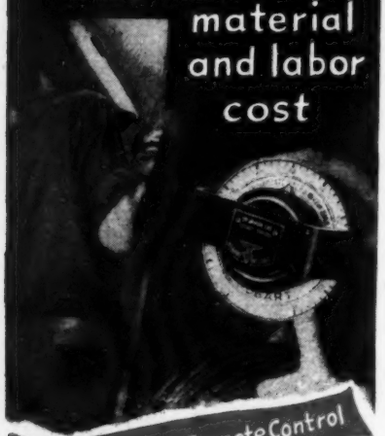
OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 546

Boston, Chicago, Detroit, Indianapolis, St. Louis, San Francisco

HOBART arc welders can save you many dollars in material and labor cost



Multi-Range, Remote Control

Cutting high labor costs, reducing amount of rejects is easy – with Hobart's Multi-Range and Remote Control. The Multi-Range feature lets the operator select the correct welding heat from 1000 possible volt-amp combinations. Hobart's Remote Control saves labor time by permitting adjustment of welding heat at the work, eliminating steps back to machine.

Cooler Operation

This is added feature that guarantees a longer, more dependable life for your Hobart. Instead of the customary end-to-end ventilation, an inbuilt fan draws in air at both ends and expels it at the center – cooling your Hobart **twice** as fast. These are only a few Hobart features – each one designed to make more profit, easier and faster. Use coupon for all the details.

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Free! Handy Vest Pocket Guide

HOBART "One of the World's Largest Builders of Arc Welders"

HOBART BROS. CO., BOX FM-116 TROY, OHIO
I'm interested in the time and cost saving advantages of Hobart Welders. Send free book, and details on items checked below:

☐ Electric Drive Arc Welder ☐ Gasoline Drive Arc Welder

NAME

POSITION

FIRM

ADDRESS

primarily with what the independent company failed to do, rather than with what the chain company did.

The independent company was locally owned and operated. Consequently, while there was little local evidence of individuals becoming wealthy as a result of the chain company plant's operation, there were a few local residents who were obviously quite wealthy as a result of the independent plant's operation. This visible evidence of opulence was coupled with a somewhat obvious lack of interest in the community by the possessors of the opulence. This, in turn, had much to do with the general community feeling that the chain plant was the better place to work.

Respect and confidence is something that a company, like an individual, must earn—a process that requires one to be active rather than passive.

The chief impediment, it seems to me, to more direct action by more companies in promoting community good-will programs grows out of an inherent inadequacy characteristic of general accounting practices. Income is shown in dollars. Outgo is measured in dollars, and all dollar expenditures show up as direct costs. Balancing one against the other with the need to keep income larger than outgo takes on the very obvious pattern of increasing income if possible but, in any event, of always trying to reduce the volume of costs.

HIDDEN VALUES

It requires real imagination to see far enough beyond the dollars spent on a community relations program to visualize those resulting savings that an accounting system cannot reveal with any degree of accuracy, if at all. It requires the capacity to step into the other fellow's shoes and look at one's self through the eyes of others, perhaps those of one's own employees. There is, too, more than a little of faith required for a busy executive to look up from his vital cost records (they really are vital) and discover the true business value of such unscientific realities as the brotherhood of men.

In my opinion, any human activity carried on for living-making purposes that takes a cut out of the pie of economic usefulness, without making some contribution to the creation of that pie, is a "racket." Perhaps the word "racket" is a bit severe. Nevertheless, it is my conviction that unionism as it has been practiced during the past ten years, by the newer unions especially, is a racket. I say this in the face of the fact that my father and my brother, wholly honest and reliable workmen, are members of unions in the steel industry. I say it because of what has happened to output per man-hour. The demands of unions for a bigger cut of the pie of economic usefulness, coupled with union sponsored reductions in the size of the pie, constitutes, where the demands are met and the reductions made effective, a racket of the first magnitude.

When an economically isolated group

What do YOU Know about FLOOR ARMOR?

Insure solid, level *enduring* floors by imbedding Klemp Hexteel or Klemp Floorsteel in concrete or mastic. Easily applied. Exposed steel surface bears the load.

KLEMP HEXTEEL

Heavy Duty Surface Armor for heaviest service on industrial floors, docks, or viaducts, etc.

KLEMP FLOORSTEEL

The Floor armor that rolls out like a rug. Provides close network of steel rails for traffic.

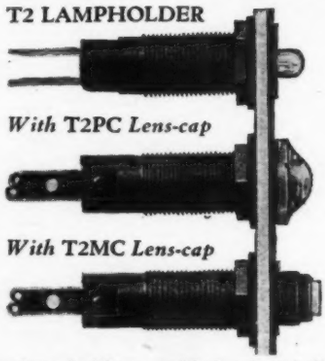
Send for complete Klemp catalog on steel flooring, gratings, stair treads, etc

WM. F. KLEMP COMPANY
"Steel Flooring Specialists"
6616 S. Melvina Ave. Chicago, 38 Illinois

KIRKLAND Pioneer
INDICATING LAMPS

TYPE T2 UNITS

T2 LAMPHOLDER



With T2PC *Lens-cap*

With T2MC *Lens-cap*

T2 lampholder, molded of bakelite, holding lip, dia. 11/16". Tip of lamp bulb protrudes sufficiently to be removed from front of panel without use of special tool.
Very low current consumption bulb (0.038 max. amp. on 24 volts). Series resistor of small size on 120-220-440 volts. etc.
T2PC Lens-cap, molded in plastic.
T2MC Lens-cap, metal with glass lens.

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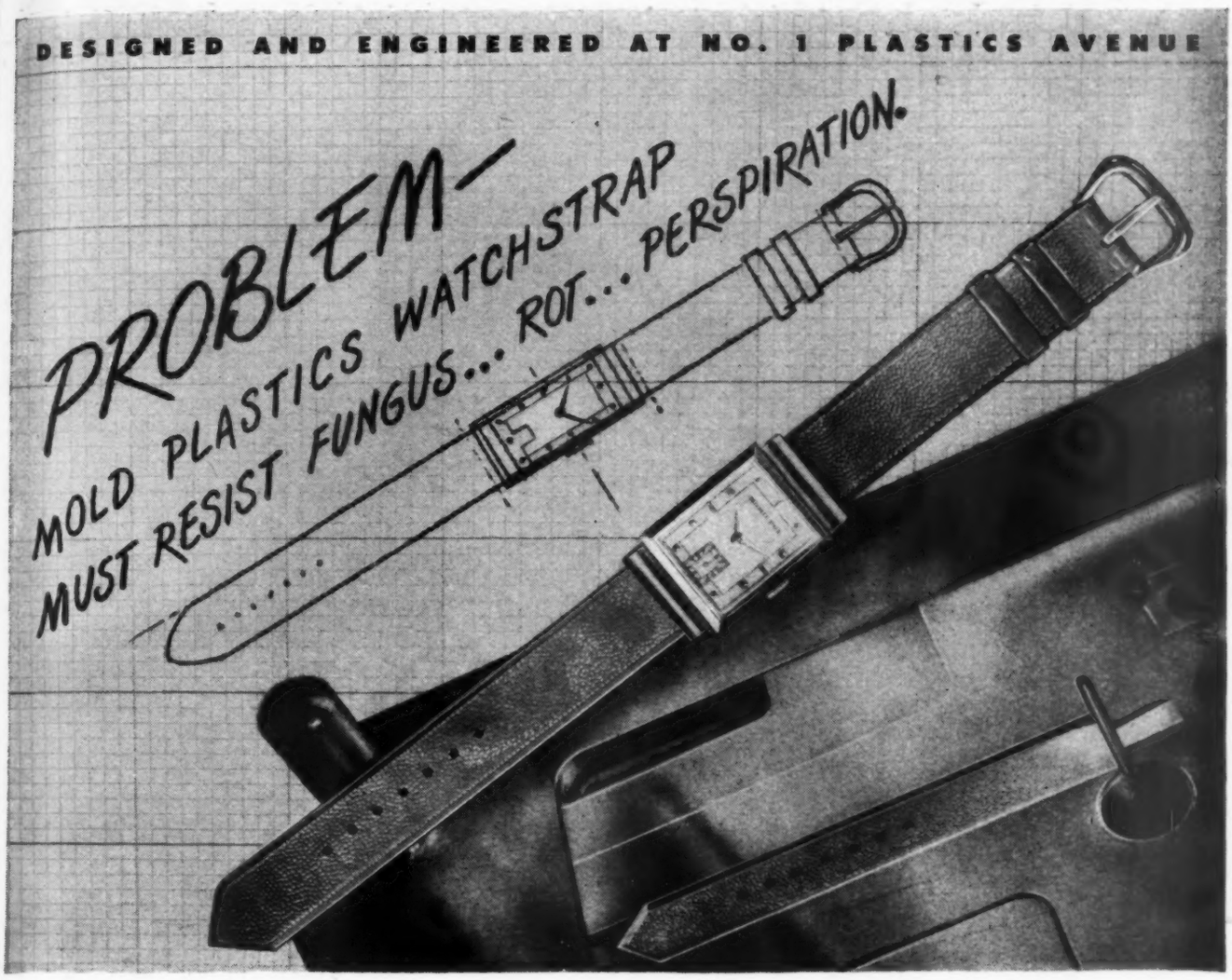
THE H. R. KIRKLAND CO.
King Street Morristown, N. J.


DESIGNED AND ENGINEERED AT NO. 1 PLASTICS AVENUE
PROBLEM—
MOLD PLASTICS WATCHSTRAP
MUST RESIST FUNGUS... ROT... PERSPIRATION.

MOLDED PLASTIC STANDS THE TEST OF TIME

LEATHER watchstraps just couldn't take the beating of jungle conditions. They rotted in no time. And too many irreplaceable watches were being lost in the field during the war.

The Hamilton Watch Company asked General Electric if plastics could do something to solve this serious problem.

Nylon was selected as the material because it is impervious to sweat . . . fungus . . . rot . . . salt water. But nylon had never before been molded, like this. A special new nylon molding compound had to be obtained. Then No. 1 Plastics Avenue specified the processes whereby molded nylon watchstraps could be produced economically in quantity.

This is one more case of plastics engineered to the job doing what no other known material can do. If you have a problem that plastics might solve, bring it to General Electric. G. E. is the world's largest manufacturer of finished plastics products. Plastics Divisions, Chemical Department, General Electric Company, 1 Plastics Avenue, Pittsfield, Massachusetts. *Why not send for the new illustrated booklet, "What Are Plastics?"*

EVERYTHING IN *Plastics*

G-E Complete Service — Everything in Plastics

Backed by 52 years of experience. We've been designing and manufacturing plastics products ever since 1894. G-E Research works continually to develop new materials, new processes, new applications.

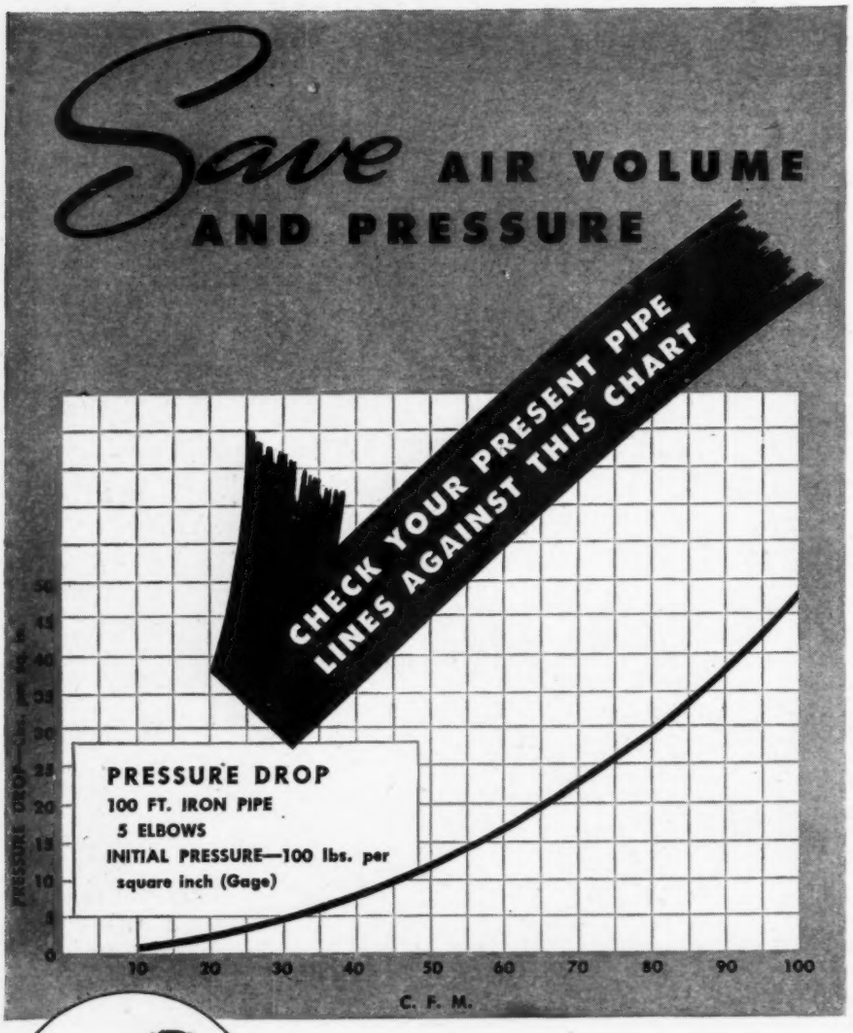
No. 1 Plastics Avenue—complete plastics service—engineering, design and mold-making. Our own industrial designers and engineers, working together, create plastics parts that are both scientifically sound and good-looking. Our own toolrooms are manned by skilled craftsmen—average precision mold experience, 12 years.

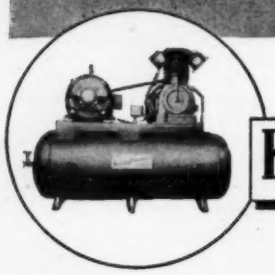
All types of plastics. Facilities for compression, injection, transfer and cold molding . . . for both high and low pressure laminating . . . for fabricating. And General Electric Quality Control—a byword in industry—means as many as 160 inspections and analyses for a single plastic part.

GENERAL ELECTRIC

CD55-A17

General Electric plastics factories are located in Fort Wayne, Ind., Meriden, Conn., Scranton, Pa., Taunton, West Lynn, and Pittsfield, Mass.





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ON-THE-SPOT AIR

Friction, alone, in long pipe lines costs money in lost air volume and pressure. Did you ever check the length of your air lines from the central compressor to the work to be done? The above chart shows over 40% loss of air pressure in only 100 feet of ½" pipe, with five elbows in the line! Why pay to produce air that is wasted? With KELLOGG-AMERICAN "On-the-Spot" Air, long pipe lines are eliminated... loss of air volume and pressure is decreased to a minimum. Get the facts about efficient, economical utilization of compressed air power. Write for your copy of the new Kellogg-American "On-the-Spot" Air folder. *American Brake Shoe Company, Kellogg Division, Rochester 9, New York.*

AMERICAN Brake Shoe COMPANY

KELLOGG DIVISION

of people want higher standards of living they must increase per individual the output of useful materials and services. This will call either for longer hours per person or for greater efficiency per hour per person. There is no other way, regardless of the economic system the group may be fostering.

OUTPUT MUST INCREASE

If the hours of work per person remain the same and output per man-hour is reduced, then the output per individual becomes less, and so long as the reduction persists, no power on earth can prevent an ultimate increase in poverty. If, in the face of reducing output per man-hour, the unions force a further decrease in output per individual by forcing an abrupt reduction in weekly hours, new and better tools cannot be developed fast enough to stop a drastic and unwholesome rearrangement of our economic system.

How to increase output per man-hour is a real problem. But it will do no economic good to effect such an increase if hours per person are reduced so as to leave the output per person where it was. Where millions of people comprise an economic group, the sheer weight of the numbers may hide the fundamental economics of Captain John Smith's dictum that those of his Virginia Colonists who did not work would not eat. The economic truth contained in this dictum, however, cannot be destroyed by weight of numbers. So long as we seek security through the parcelling out of money rather than the parcelling out of work, we shall compound our insecurity.

PERSONNEL RAIDS ON COLLEGES SHORTSIGHTED

DR. JAMES R. KILLIAN, Vice-President, Massachusetts Institute of Technology, in "The Lamp"

In view of the magnitude of the current deficit [of technically trained personnel] and the long period required to make up the shortage, our educational institutions must work at top speed and every effort must be made to utilize existing scientific manpower effectively.

Industry can aid in both the immediate and long-term production of an adequate number of first-rate scientists and engineers . . . by not raiding college teaching staffs for its own personnel needs. The colleges are already desperately short . . . of instructors.

It is estimated that industry, government, and education will need at least 90,000 new engineers between June of this year and June, 1950. There is no way in which such demands can be met except by training new men. . . . [To do this requires] greater permanent educational capacity in colleges and universities of the nation. . . . The great majority of our present graduate students are working part time, many of them as teaching assistants, not only to finance their own educations, *but also to help their colleges.*

Industry can always outbid the col-

WANT TO DOUBLE WHEEL LIFE AND IMPROVE FINISH?
Plant after plant reports amazingly better wheel life and finish on grinding jobs after switching to Cimcool Cutting Fluid. Why? Because this revolutionary new *chemical emulsion* has an extremely low surface tension that allows grit and chips to settle out rapidly... and because Cimcool's property of *chemical lubricity* reduces friction to an absolute minimum, while cooling rapidly. Try Cimcool and you'll agree.
ALSO WITH CIMCOOL...
● Faster cooling allows faster cutting.
● Uniform work temperature increases accuracy.
● Chemical lubricity increases tool life.
● No fire hazard—No smoke—No slippery film.
● Non-irritating—Doesn't grow rancid.
● Contains long-lasting rust inhibitor.
● Covers 85% of ALL METAL WORKING JOBS.
CIMCOOL DIVISION OF
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.
FINISH 15 TO 25% BETTER, WHEEL LIFE DOUBLED, says TECHNICAL PRODUCTS CO., of Hollywood, California
"Using the same machine, same wheel, same operator and material, we ground parts with other coolants, then changed to Cimcool. We find that our finish is from 15 to 25 percent better . . . and we at least double the amount of parts per wheel dress." This letter is typical of many in our files which we will gladly show you.
CIMCOOL
Reg. U. S. Pat. Office
THE MULTI-PURPOSE CUTTING FLUID

WHY PUSH WHEN YOU CAN CONVEY

Pushing material around is not only slow, hard work — it's costly material handling — there's an easy way to do it.

Investigate the use of conveyors. Conveyors handle a wide variety of parts, packages, units, cans, bottles, barrels, bundles, drums and boxes. Available in light, medium or heavy-duty types — portable or stationary — as systems, sections or units — power or gravity fed, they give you remarkable savings in time, money and manpower conservation. They relieve confusion and congestion.

Standard Conveyor Company has the experience and facilities to engineer, recommend and furnish the right type of conveyor for your particular needs.

Write today for catalog No. FM116 "Conveyors by Standard"—a ready reference on conveyor types and systems.

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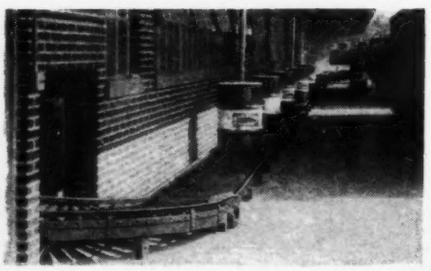
PRODUCTION LINES
Slat type conveyor used to speed assembly and crating of refrigerators.

STORAGE AREAS
Portable "Handibilt" conveyors used as a continuous conveyor line in storage area.



LOADING PLATFORM
Oil drums leave the warehouse for loading into boxcars on gravity roller system.

ROLLER - BELT - SLAT - PUSHBAR CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

leges on a salary basis, but I believe it would be an extremely shortsighted policy for industry at the present time to draw men from the colleges at the expense of the present effort to increase the nation's reservoir of trained personnel.

BEHIND THE BYLINE

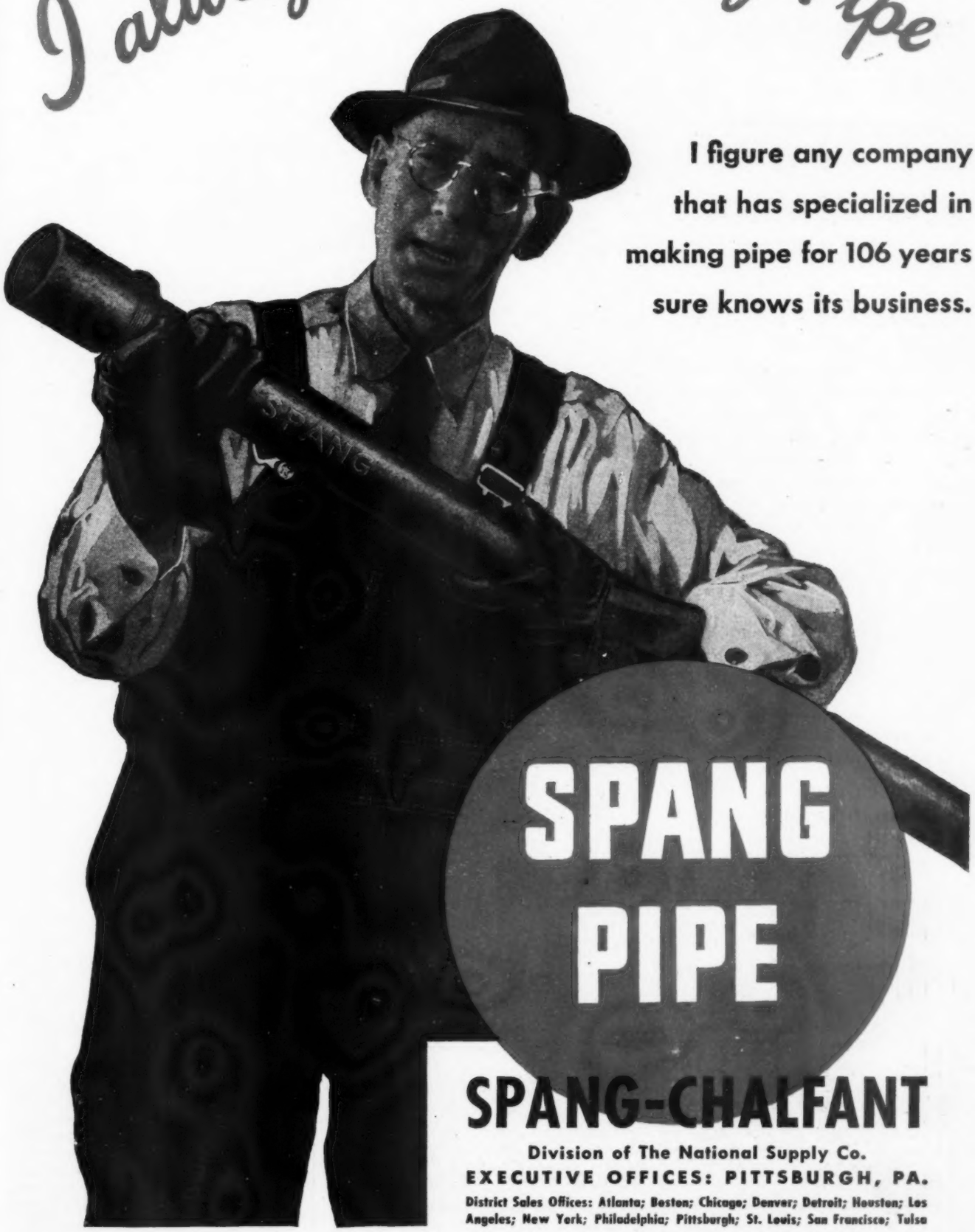
Facts About Factory's Authors

In recent months, Clifford W. Kennedy (page 102) has been devoting nearly full time to the active exploitation of war-developed quality control techniques. A native of Connecticut, he has worked for Remington Arms and other New England firms. During the war he served as chief inspector at the Denver Ordnance Plant. He is now quality control engineer at Federal Products Corporation. He is active in the Boston Society for Quality Control, and is a charter member of the American Society for Quality Control.

Albert Demsky (page 106) is primarily interested in machines—properly used and economically installed. For the past 18 years he has been managing director of sales and production for Berger Machine Products, Inc. In the past 6 years the particular emphasis of his work has been on the production of 50 caliber machine gun link dies and metal tube parts for radar. His educational background was industrial cost accounting at City College of New York. He is a member of National Screw Machine Manufacturing Association and Queensborough Chamber of Commerce, New York.

J. T. Purtell (page 118) is a native of Watervliet, N.Y., where he is now employed. He graduated from LaSalle Institute, Troy, N. Y., in 1925. The same year he started to work for Ludlum Steel Company in the forge department. He was, in progressive steps, promoted to the production control department, placed in charge of the mill order department, and transferred to the sales department as assistant manager of orders. In 1940 he took a night course in metallurgy at Rensselaer Polytechnic Institute. This was followed by his

I always use "Spang" Pipe



I figure any company that has specialized in making pipe for 106 years sure knows its business.

SPANG PIPE

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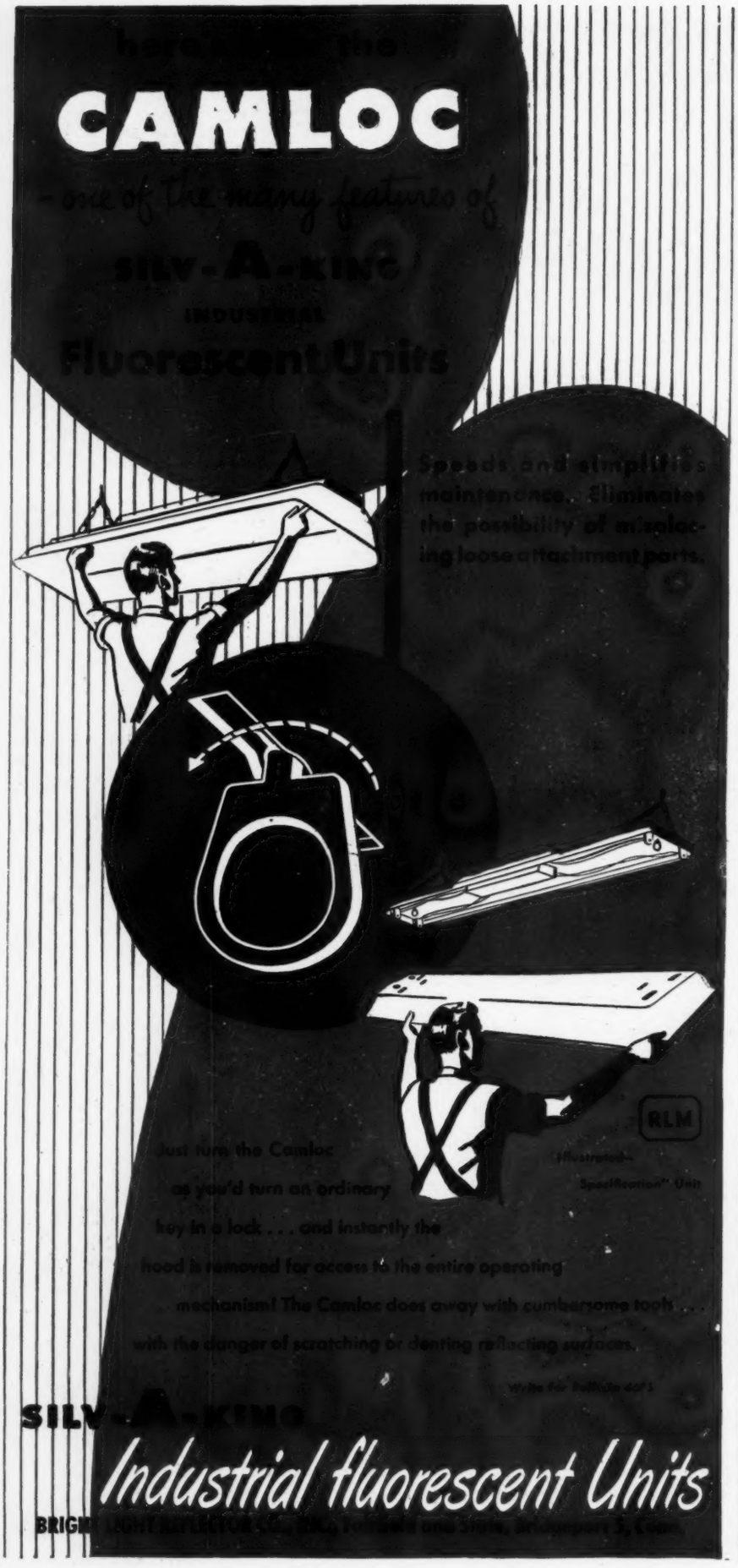
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SILV-A-KING
Industrial fluorescent Units

assignment to Ludlum's eastern Massachusetts territory as a salesman. In 1943 he was transferred to the Watervliet plant of Allegheny Ludlum Steel Corporation. He is now in charge of the service department. His hobbies—golf, fishing, bowling—provide action for any season and in any kind of weather.

The widely varied background that John V. Valenteen (page 125) brings to his work includes accounting, teaching, and industrial engineering. He holds a B. S. degree and a professional I. E. degree from Pennsylvania State College, and is a member of Tau Beta Pi and the Society for the Advancement of Management. His industrial experience includes former association with General Electric Company, Textile Machine Works, and Philadelphia Transportation Company. He is now staff industrial engineer with the Armstrong Cork Company.

Robert C. Berman's article (page 130) is his third contribution to FACTORY. In addition to technical articles, he writes fiction, satire, music. He draws cartoons and contributed those that appear in this article. He followed a psychology major at Harvard. His industrial career was started in the field of industrial engineering; he then specialized in work simplification and factory training. He is a member of the Boston chapter of the Society for the Advancement of Management.

In 1936, R. F. Bartlett (page 142), then 19 years of age, started to work for Victor Adding Machine Co., as an errand boy. In the following ten years he progressed with that company to reach his present position of plant engineer. He attended Illinois Tech., is a member of the American Society of Safety Engineers, and vice-president of the Neighborhood Boys Club Alumini. One of his most active outside interests is boys club work.

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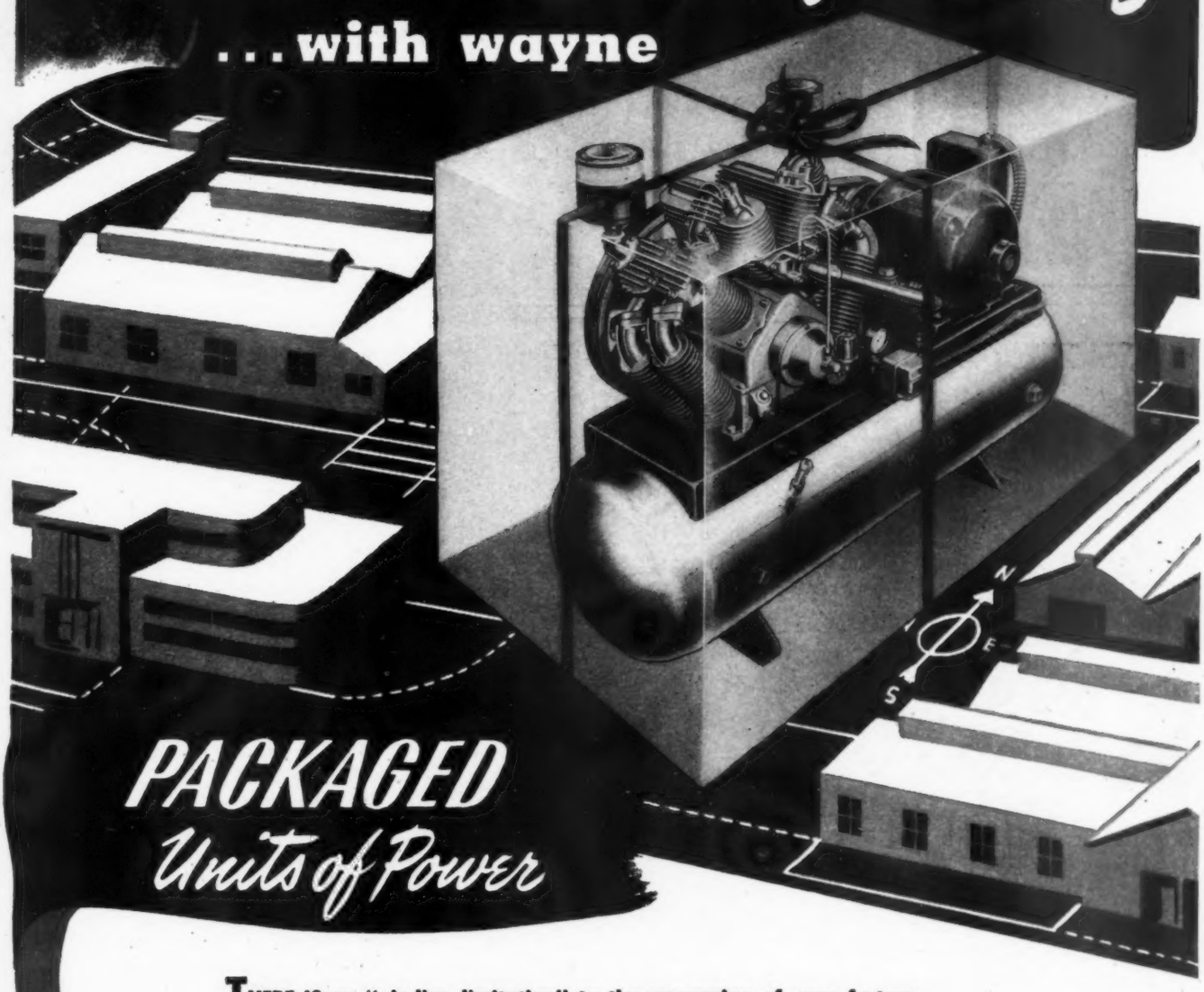

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CANADIAN WAR PLANT MULTIPLE TENANCY

JAMES MONTAGNES, Canadian Correspondent For FACTORY

The Canadian government has found a way to make one postwar problem solve another. It is renting large war surplus plants to many diversified small industries on a basis of multiple tenancy. Thus two problems are taken care of at the same time: a good use is found for large idle plants; space is provided, in the face of building shortages, for new and expanding small industries. This is being done under the direction of the Canadian government's Department of Reconstruction.

At present, three former war plants are being occupied by small industries under this multiple tenancy policy. Two are in Montreal, one is in Toronto. At Montreal there is the Verdun Industrial Building, a former munitions factory, occupying about 400,000 square feet of space, and Crown Industrial Building, also a munitions plant, with 350,000 square feet of area. At Toronto, the Liberty Building, a former gun manufacturing plant built during the war, has 300,000 square feet of space. Other large plants may be made available for multiple tenancy.

CAREFUL SELECTION

Government decision to make these large factories available on a rental basis was widely publicized throughout Canada. Firms interested in taking space at rentals competitive for similar space in the area applied to War Assets Corporation. In addition to the general information required, the applications asked for data on types of manufacturing done, whether export marketing was planned, how many persons were employed, and how many would be employed as a result of expansion. The number of people to be given year round employment was a major factor in obtaining space in the plants.

An idea of how diversified are the industries in the three buildings that now come under this plan is to be had from a list of tenants. In the Toronto building are manufacturers of oil burners, kitchen utensils, disinfectants, radio loud-speakers, packaging machinery, dealer displays, food products, measuring instruments, pencils and pens, glass etchings, valves and fittings, and an electric power utility. These tenants occupy space ranging from 9000 to 35,000 square feet. They employed less than

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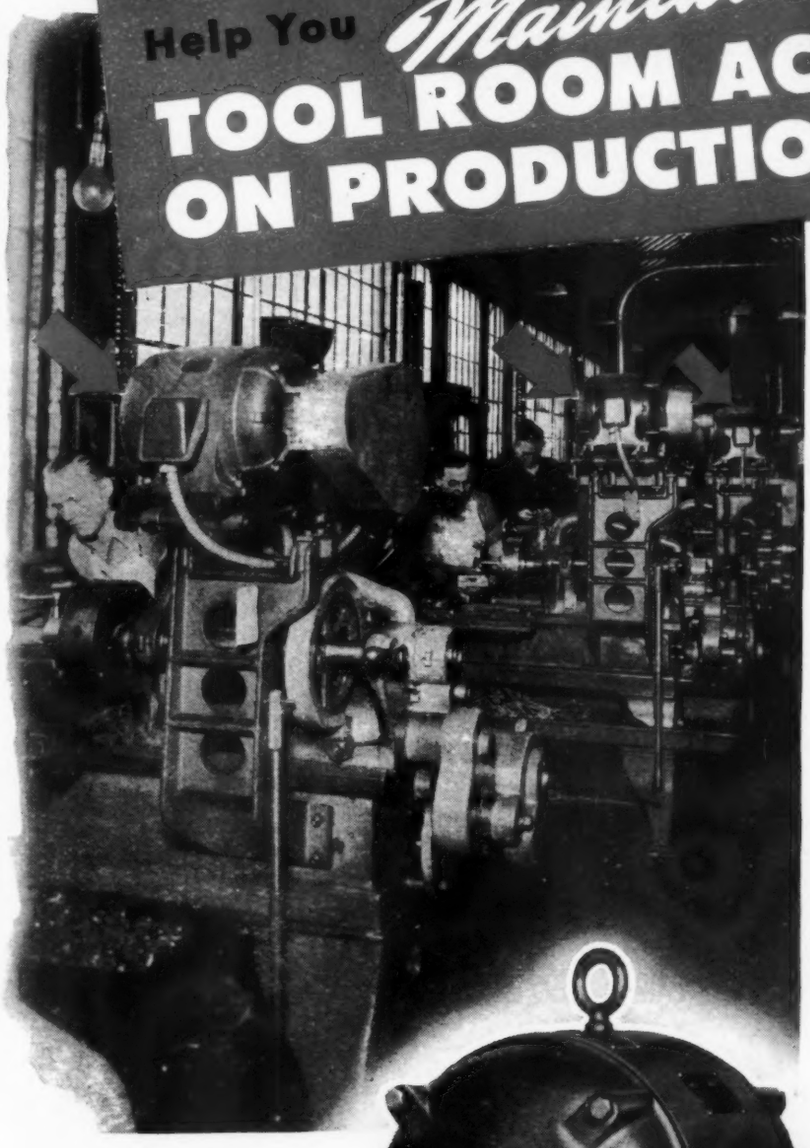

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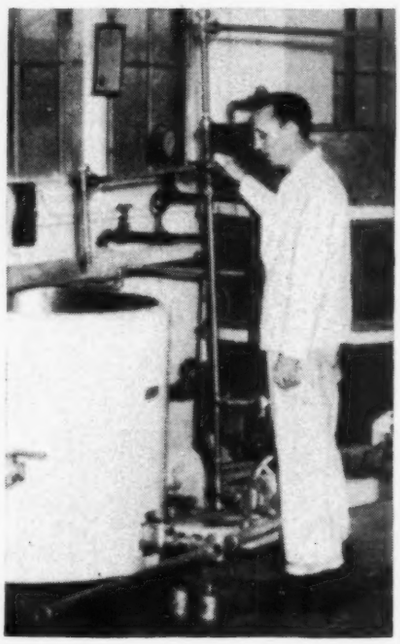
700 workers in their old quarters. They plan to employ 1700 persons in the government building.

In Montreal the Verdun Industrial Building has 36 tenants, 16 of which are new businesses, and the others are expanding their organizations. The established firms had just under 800 on the payroll. All the industries in this plant when fully operating will employ about 3000 workers. In this larger set-up, the diversification is even wider than in the Toronto development. The other Montreal plant, Crown Industrial Building, has twenty-four tenants engaged in various types of work.

SERVICES FURNISHED

The buildings have been subdivided according to space needs of tenants. The rental administration supplies heat to the buildings during normal working periods and water for ordinary washroom uses. Additional service, including light and gas, must be paid for by the tenant. Cleaning is also done at the individual company's expense.



Part of one of the kitchens installed by the J. H. Stafford Industries, one of the small industries occupying a wartime surplus building in Toronto on a 5-year tenancy basis

Buildings all have adequate railway sidings and loading platforms. Trucking and parking areas are available. Cafeteria accommodation is available through concessions in the plants or at nearby factories. Leases in all three buildings terminate April 30, 1951. Renewal of leases at that time is anticipated.